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Further notes on *Eupithecia* (Lepidoptera, Geometridae) from Nepal and the Indian subcontinent

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Abstract Accounts of *Eupithecia* (Lepidoptera, Geometridae) in the Indian subcontinent in recent papers are supplemented, some little known species are described and illustrated, and some range increases documented. Thirteen new species, *Eupithecia lusoria* sp. n., *E. rulena* sp. n., *E. superata* sp. n., *E. himalayata* sp. n., *E. claudei* sp. n., *E. nervosa* sp. n., *E. spinibarbata* sp. n., *E. fibigeri* sp. n., *E. filia* sp. n., *E. laszloi* sp. n., *E. singhalensis* sp. n., *E. kama* sp. n., and *E. idaeoides* sp. n. are described. One species, *Eupithecia pallescens* Inoue, 2000 is renamed here as *E. fessa* Mironov & Galsworthy nom. n., because the name *pallescens* was preoccupied by Dietze (1910) for the Central Asian form of *Eupithecia sinuosaria* (Eversmann, 1848).

Key words Nepal, India, Lepidoptera, Geometridae, *Eupithecia*, revision, taxonomy, synonymy, new species.

Introduction

This paper is one of a series surveying the *Eupithecia* fauna of south and east Asia. It follows papers on Taiwan (Mironov & Galsworthy, 2007), the western Himalayas (Mironov, Galsworthy and Ratzel, 2008*a*, *b*, and *c*), and south east Asia (Mironov & Galsworthy, 2009*a* and *b*). It does not seek to cover comprehensively the *Eupithecia* fauna of the region under consideration, but to fill gaps left by the previous papers. Many of the species occurring in the northern part of the Indian subcontinent have already been dealt with in those papers. In this paper we describe a number of new species which occur outside the areas covered in previous papers, provide details of some older species which have been little known in the past, record some new locations for already described species, and correct some errors in earlier work.

Although the fauna of the northern part of the subcontinent is well represented in international collections, there is little *Eupithecia* material from the central and southern parts, despite the fact that these areas are quite well represented by material in the BMNH dating from the period of British rule. It is likely that the genus becomes progressively less speciose towards the south, as is the case in SE Asia. Nevertheless, a few species have been described from southern India and Sri Lanka, and, except for one or two species which are widespread and have been dealt with in our previous papers, these are covered here. For the most part they are known only from their original type series. It is likely that more species remain to be discovered in this area.

In all we describe thirteen new species of Nepalese and Indian *Eupithecia* from collections in the Natural History Museum (BMNH, London), the Zoologische Staatssammlungen (ZSM, Munich), the collection of Mr C. Herbulot (ZSM, Munich), the private collection of Mr M. Fibiger (Sorø, Denmark), and that of Mr G. Lázsló (Budapest).

Abbreviations: ZSM: Zoologishes Staatssammlung, Munich, Germany; BMNH: The Natural History Museum, London, United Kingdom; NSMT: National Science Museum, Tokyo, Japan;

IZCAS: Institute of Zoology of the Chinese Academy of Sciences, Beijing, China; MNHU: Museum für Naturkunde, Zentralinstitut der Humboldt-Universität zu Berlin, Germany; TTM: Termeszettudomanyi Muzeum Allattara (Hungarian Natural History Museum), Budapest, Hungary; ZFMK: Zoologisches Forschungsinstitut und Museum Alexander Koenig, Bonn, Germany; ZISP: Zoological Institute, Russian Academy of Sciences, Saint Petersburg, Russia; coll. GL: coll. Gyula M. László, Budapest.

New species

Eupithecia lusoria Mironov & Galsworthy, **sp. n.** (Fig. 1)

Description. A small species. Wingspan 15 mm; fore wing 9 mm. Labial palpi shorter than diameter of eye, covered with brownish scales. Head, collar behind eyes and patagia covered with whitish scales. Notum dark brown. Fore wing triangulate, with bowed costal margin; basal transverse line curved; postbasal and antemedial lines dentate, right angled near costa and forming a dark brown costal spot; postmedial line evenly curved, convex, sharply angled inwards on to R, forming a dark brown costal blotch; basal and medial areas dirty white with brownish tinge; terminal area darker, covered with blackish brown scales, slightly lighter in the middle and reddish brown near apex of wing; pale subterminal line indistinct; discal dot small, narrow and elongate, oblique, dark brown; fringe chequered brown and dirty white. Hind wing relatively narrow, with uneven, rather angulate terminal margin and narrowly rounded apex; ground colour dirty white with yellowish brown tinge; transverse lines wavy, distinct along anal margin; terminal margin darker, especially near termen where covered with reddish brown scales; discal dot distinct, relatively large, narrow, elongate and oblique; fringe as fore wing. Abdomen dirty white with brownish tinge, the second abdominal segment light brown, with elongate lateral blotches of black scales.

Male genitalia (Fig. 21). Uncus membranous, plate-like, strongly bifurcate at apex. Valva shaped like an orange segment, with evenly curved ventral margin and broadly rounded apex; sacculus lightly sclerotized. Vinculum short and narrow, tapered to apex. Papillae on anterior arms of labides short and broad, slightly tapered to apices, covered with short setae. Aedeagus shorter than length of valva, elongate and very narrow, with two short lateral hirsute lobes at posterior end; vesica armed with one very small, *V*-shaped cornutus near ductus ejaculatorius base and one very small sclerotized cornutus at the middle. Sternite A8 lyre-shaped, with two narrow, sinuate, apically blunt rods, increasingly sclerotized towards their apices, connected with each other by a narrow basal band; basal lobes and accordingly basal hollow absent, apical hollow membranous, narrow and very deep.

Female unknown.

Range. Nepal, district Khumbu Himal, province Sagarmatha.

Similar species. This species belongs to the "*haworthiata*" species group (Vojnits, 1972), which is distinguished by the lamellar plate replacing the uncus in the male genitalia. It can be easily separated from other Asian *Eupithecia* species by the extent of the white colouring and the distinctive maculation of the wings, and especially by the very broad white medial areas on the fore wings. The male genitalia of *E. lusoria* are similar to those of *E. fletcheri* Prout, 1926 but very clearly distinguished by the shorter uncus and valva, the narrower and tapered vinculum and the longer aedeagus.

Holotype ♂: Nepal, Solu Khumbu Himal, 5 km E of Lukia, 3,200 m, 27. vi. 1993, leg. M. Hreblay & G. Csorba, Mironov slide no. 531 (TTM).

Eupithecia rulena Mironov & Galsworthy, **sp. n.** (Fig. 2)

Description. Rather a small species. Wingspan 16.5–18 mm; fore wing 9–10 mm. Labial palpi pale, covered with ochreous scales, almost equal in length to diameter of eye. Head light ochreous; collar behind eyes ochreous brown. Notum dark brown. Fore wing triangular, costal margin slightly arched, terminal margin evenly curved, apex pointed; ground colour rusty brown; transverse lines straight, obtusely angled near costa; postmedial line twice obtuse angled near costa; basal and medial areas brown, darker along costa where they form elongate dark brown costal blotches; terminal area rusty brownish with large dark brown costal blotch and distinct pale wavy subterminal line; terminal line relatively broad, brown, interrupted by veins; transverse bands between basal, medial and terminal areas rusty; discal dot of normal size, ovoid, black; fringe relatively long and distinctly chequered with brown and rusty. Hind wing with uneven terminal margin; ground colour lighter, pale ochreous, but darker brownish along anal margin and near termen; transverse lines inconspicuous; discal dot paler, rounded, brown; terminal line and fringe as fore wing. Abdomen brown or dark brown, the last segment lighter, ochreous with brownish tinge.

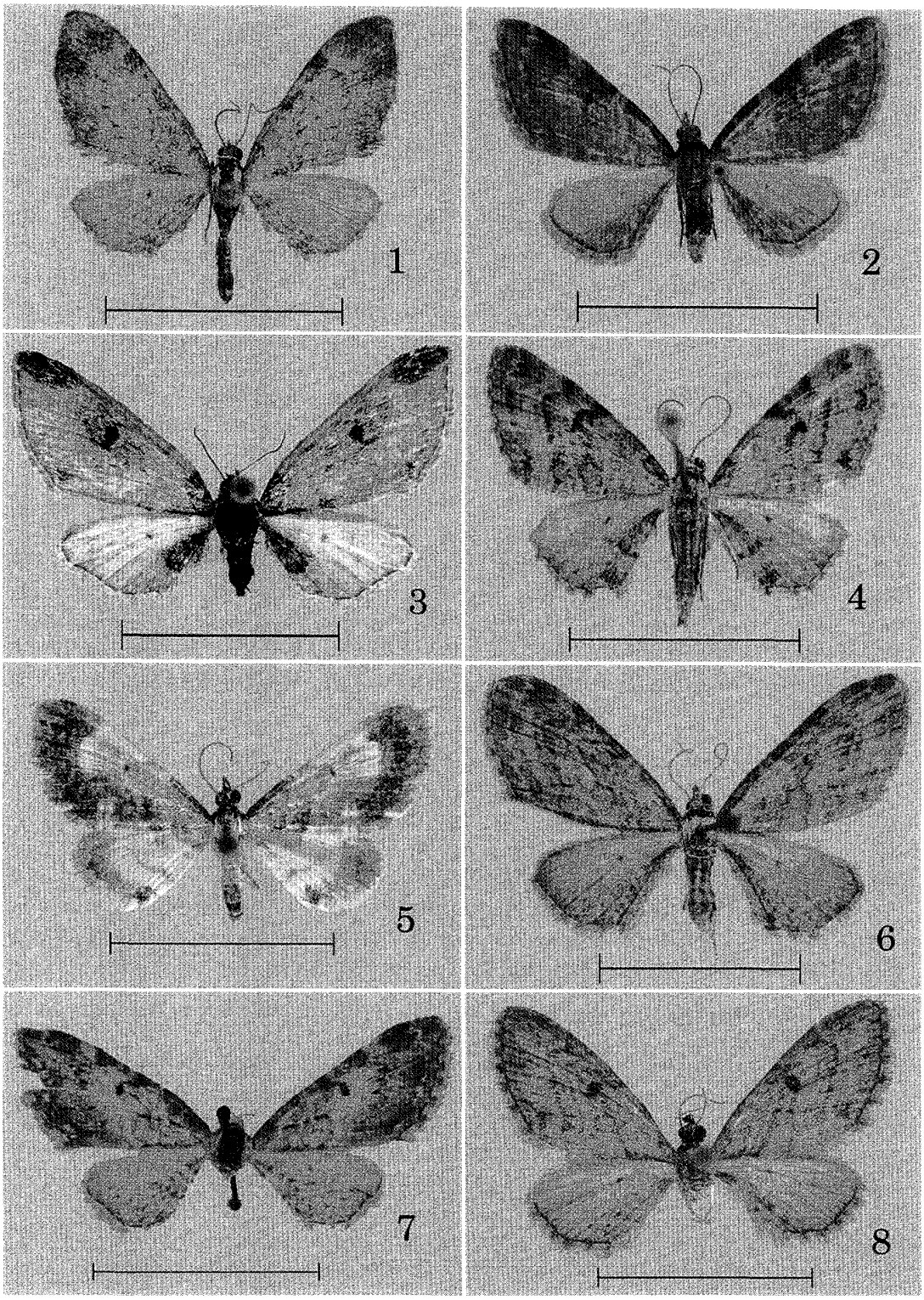
Male genitalia (Fig. 22). Uncus elongate, thin, uniapical. Valva shaped like an orange segment, elongate, with almost straight dorsal margin, evenly curved ventral margin and narrowly rounded apex; sacculus lightly sclerotized. Vinculum of average size, semicircular. Papillae on anterior arms of labides rather clavate, broadened and covered with dense, short setae at apices. Aedeagus stout, almost equal to length of valva. Vesica armed with two cornuti (one large, elongate, bifurcate in middle and the other small, folded, irregular, near anterior end of aedeagus). Sternite A8 weakly sclerotized, peg-like with rounded apex and very shallow basal hollow.

Female genitalia (Fig. 24). Bursa copulatrix large, membranous, egg-shaped, with two large lateral patches of dense, very small spines. Ductus bursae elongate, wide, S-shaped, with a small patch of very narrow spinules. Ductus seminalis long, attached to bursa copulatrix at anterior end. Colliculum collar-like, relatively short and narrow, inclined to one side. Antrum short, broad, lightly sclerotized. Tergite A8 short and broad, with broadly rounded posterior corners and deep medial hollow in the posterior margin. Apophyses anteriores relatively short and narrow, slightly expanded at apices; posterior apophyses narrow, relatively short, not expanded at apices. Papillae anales rounded, covered with medium-sized setae.

Range. Nepal, Katmandu area.

Similar species. This species belongs to the "*proterva*" species-group (Group B of Inoue, 1979). It is externally similar to two Taiwanese species *E. convexa* Inoue, 1988 and *E. concava* Mironov & Galsworthy, 2007, but is smaller, with fore and hind wings less elongate and narrow, and the dark brown medial area narrower on the fore wing than in either of those species. The fore wing discal dots are also smaller than in *E. concava*. The male genitalia of *E. rulena* sp. n. are similar to those of *E. subbreviata* Staudinger, 1897, but can easily be distinguished by the longer uncus and valva, the different shape of the papillae on the anterior arms of the labides and the narrower sternite A8, which is more similar to that of *E. flavoapicaria* Inoue, 1979. The female genitalia are unique in the elongate, broad, *S*-shaped membranous ductus bursae with a small patch of very narrow spines, the large egg-shaped bursa copulatrix, densely covered with similar slim spines on both sides, the long ductus seminalis on the anterior end of the corpus bursae and the short and broad eighth tergite with deep medial hollow in the posterior margin.

Holotype ♀: Nepal, 20 km SSE Katmandu, Route du Phulchoki, 2,400 m, 4. x. 1983, C. Herbulot; Paratypes 1♂, 1♀, same locality, date and collector, Mironov slides nos 615♂,



Figs 1–8. *Eupithecia* adults (scale bar = 1 cm): 1– *E. lusoria* Mironov & Galsworthy, sp. n. (holotype); 2–*E. rulena* Mironov & Galsworthy, sp. n. (holotype); 3–*E. superata* Mironov & Galsworthy, sp. n. (holotype); 4–*E. himalayata* Mironov & Galsworthy, sp. n. (holotype); 5–*E. claudei* Mironov & Galsworthy, sp.n. (holotype); 6–*E. nervosa*, Mironov & Galsworthy sp. n. (holotype); 7–*E. spinibarbata* Mironov & Galsworthy, sp.n. (holotype); 8–*E. fibigeri* Mironov & Galsworthy sp. n. (holotype).

616♀ (coll. Herbulot in ZSM).

Eupithecia superata Mironov & Galsworthy, **sp. n.** (Fig. 3)

Description. Wingspan 20 mm; fore wing 11 mm. Labial palpi, frons, vertex and notum covered with black scales. Metanotum with two fan-shaped, groups of black scales protuding upwards. Fore wing narrow and elongate, costal margin slightly arched, terminal margin obliquely curved, apex pointed; ground colour delicate pale ochreous with soft pink tinge; basal area black; medial area around discal dot covered with scattered black scales; apex with a wedge-shaped blackish mark; tornus with small blackish spot; transverse lines not expressed; discal dot large, oblique, ovoid, intensely black; terminal line narrow, dark, interrupted by veins; fringes short, unicolorous, pale ochreous. Hind wing narrow and elongate, with narrowly rounded apex and with shallow medial hollow in terminal margin; ground colour paler, whitish ochreous, but darker ochreous near tornus; basal area between stalk of Cu and anal margin black, with clear cut edges, except tornus, which is ochreous; transverse lines not expressed; discal dot considerably smaller and paler, oblique, ovoid, blackish; terminal line and fringes as fore wing. Abdomen black.

Male genitalia (Fig. 23). Uncus very short, pointed to apex, biapical when viewed laterally, with two long lateral setae at base of apical part. Valva relatively short, broadened at base and sharply tapered to rounded apex, with bowed dorsal margin and narrowly rounded and upturned apex; sacculus lightly sclerotized. Vinculum rather broad and elongate, tapered. Papillae on the anterior arms of labides large, long and moderately thick, covered with setae in apical half. Aedeagus large, stout, very long, strongly broadened and slightly curved at anterior end, about twice as long as valva. Vesica granulate, with numerous wrinkles, armed with one long, narrow, folded, H-shaped cornutus, with two narrow and curved anterior arms, and with one smaller, irregular cornutus at anterior end of aedeagus. Sternite A8 small, relatively broad, peg-like, broadened near base, with two very short and diverging, sclerotized apical rods; basal and apical hollows very shallow.

Female unknown.

Range. NE India. Known only from the holotype, collected in Meghalaya State.

Similar species. A handsome species belonging to the *proterva* group (Group B of Inoue, 1979), with a unique facies which could not be confused with any other *Eupithecia*. The distinctive maculation, large discal dots and delicate pale pinkish ochreous ground colour of the fore wings separate it from other closely related *Eupithecia* species. The male genitalia are rather similar to those of the allied Taiwanese species *E. hashimotoi* Inoue, 1988, but can be easily distinguished from it by the shorter uncus with two long lateral setae at base, the longer papillae on the anterior arms of the labides, the larger and stouter aedeagus with strongly broadened anterior end, the large cornutus with longer and curved anterior arms, and the shape of eighth sternite.

Holotype ♂. NE India — Meghalaya, Nokrek Nat. Park, Garo Hills, 1,150 m, 25°25′N, 90°20′E, 13–22. xii. (19) 97, leg. Siniaev *et al.*, *ex.* coll. A. Schintlmeister, Mironov slide no. 617♂ (ZFMK).

Eupithecia himalayata Mironov & Galsworthy, **sp. n.** (Fig. 4)

Description. Wingspan 17.5–20 mm; fore wing 9–10 mm. Labial palpi brown. Head covered with pale rusty brownish scales, with two small tufts of blackish brown scales near base of antennae. Notum pale rusty brownish with a broad, dark brown transverse band at front. Fore

wing triangular, rather narrow and elongate, with slightly arched costal margin, oblique, evenly curved terminal margin and narrow apex; ground colour rusty brown; basal line oblique, right angled onto costa; basal area darker, blackish brown; antemedian line right angled onto costa, broadened, blackish brown near costa; postmedial line twice obtusely angled onto costa; medial area between them darker, blackish brown, giving appearance of a transverse fascia; terminal area darker brownish with three darker, blackish brown blotches (apical, medial and tornal), also with light, wavy subterminal line and small tornal spot; discal dot relatively large, oblique, ovoid, intensely black; terminal line narrow, black, interrupted by veins; fringes clearly chequered brown and whitish with rusty tinge. Hind wing relatively broad with slightly angulate terminal margin; ground colour lighter, rusty brown; transverse lines brown, well marked along anal margin only, especially the distinct basal and postmedian lines; terminal area slightly darker brownish with large blackish brown and small, pale, tornal spots, and an inconspicuous, narrow, wavy light subterminal line; discal dot distinct, smaller and paler than on fore wing, rounded or comma-like; terminal line and fringes as fore wing. Abdomen light rusty brown with broad, black lateral stripes.

Male genitalia (Fig. 27). Uncus elongate, thin, biapical. Valva elongate, shaped like an orange segment, with almost parallel dorsal and ventral margins, dorsal margin slightly bowed, ventral margin evenly curved and apex broadly rounded; sacculus lightly sclerotized. Vinculum short and narrow, semicircular. Papillae on anterior arms of labides slightly elongate, thin, covered with short setae at apices. Aedeagus relatively short and stout, shorter than length of valva. Vesica armed with two short, basally broadened, horn-like apical cornuti, one small, broad, U-shaped cornutus in the middle, and one small, folded, irregular cornutus near ductus ejaculatorius base. Sternite A8 weakly sclerotized, consisting of two narrow, elongate, almost parallel arms, connected with each other by a broad basal band; basal hollow very small and shallow; apical hollow membranous, narrow and very deep.

Female genitalia (Fig. 35). Bursa copulatrix small, globular, densely covered with small spines. Ductus bursae elongate, slightly curved and tapered to colliculum, sclerotized, with numerous longitudinal striations, spineless. Ductus seminalis broad, broadly attached to central part of ductus bursae on right side. Colliculum collar-like, rather large, about as broad as long. Antrum membranous. Tergite A8 spade-shaped, with sclerotized anterior margin and medially prominent posterior margin. Anterior and posterior apophyses thin. Papillae anales rounded at apices.

Range. Nepal. Known from district near Katmandu, provinces Dhaulagiri and Gandaki.

Similar species. This species is allied to a number of similar species near to *rajata* Guenee, which probably form a distinct group, yet to be defined. Externally it is rather similar to *E. pyreneata* Mabille, 1871 and its allies, but is slightly darker, with darker ante- and postmedian lines and larger, black discal dots on the fore wings. The genitalia of *E. himalayata* sp. n. are similar to those of *E. lobbichlerata* Schütze, 1961, but clearly differ from them in the longer uncus, shorter papillae on the anterior arms of labides, shorter and broader apical horn-like cornuti on the vesica and narrower eighth sternite with longer apical arms in male, and in the globular corpus bursae, the longitudinally striate, sclerotized and spineless ductus bursae, and the broad ductus seminalis, which is broadly attached to the central part of the ductus bursae, in female.

Holotype ♂: Nepal, 20 km SSE Katmandu, Route du Phulchoki, 2,400 m, 4. x. 1983, C. Herbulot, Mironov slide no 618♂ (coll. Herbulot in ZSM). Paratypes: 3♀♀, Nepal, Centr., N Ganesh Himal, Nesim, 2,200 m, 23. x. 1995, leg. M. Fibiger; 1♀, Nepal, 8 km SE Jomson, Thadung, 3,500 m, 11. viii. 1996, leg. M. Fibiger, Mironov slide nos 619♀ (all in coll. Fibiger).

Note: Three of the female paratypes mentioned above are very worn.

Eupithecia claudei Mironov & Galsworthy, **sp. n.** (Fig. 5)

Description. Wingspan 18 mm; fore wing 9.5 mm. Labial palpi pointed, about equal to length of diameter of eye, covered with brownish scales. Notum pale whitish yellow. Fore wing rather elongate, costa straight, curved near apex only, termen evenly curved, apex obtuse; basal area light brown, especially along costal margin; median area broad, pale yellow, irrorated by scattered orange scales, with a large blotch of orange and brownish scales from M3 to anal margin; terminal area broad, light brown, but yellowish narrowly along terminal margin; discal dot small, narrow and slightly elongate, brown. Hind wing ovoid; basal area pale brown; medial area broad, pale yellow, with orange postmedian transverse line; terminal area broad, light brown, with large light, yellowish blotch along termen from M3 to tornus; discal dot very small, rounded, brownish. Abdomen pale whitish yellow; four last segments covered with brownish scales.

Female genitalia (Fig. 25). Bursa copulatrix small, rounded, completely and densely covered with small spines, which extend onto the ductus bursae almost to the base of the colliculum along the right side. Ductus bursae short with large and broad, membranous, spineless diverticulum, broadly attached to ductus bursae on left side. Colliculum collar-like, short and moderately narrow. Antrum membranous, covered with numerous minute pores. Tergite A8 small, almost quadrate. Anterior and posterior apophyses relatively short and thin; anterior apophyses slightly thicker than posterior ones. Papillae anales rounded, covered with short setae.

Male unknown.

Range. Nepal. Katmandu area.

Similar species. A handsome and distinctive species, possibly belonging to the *venosata* group, which could not be confused with any other *Eupithecia*, and superficially looks more like a sterrhine than a larentiine. The female genitalia are similar to those of *E. karli* Ratzel & Mironov, 2007 from Kashmir, but clearly distinguished from them by the smaller spiniferous area in the corpus bursae, the longer membranous diverticulum of the ductus bursae, the narrower eighth tergite, the shorter apophyses, and the narrower papillae anales.

Holotype. ♀, Nepal, 20 km SSE Katmandu, Route du Phulchoki, 2,400 m, 3. x. 1983, C. Herbulot, Mironov slide no 530♀ (coll. Herbulot in ZSM).

Derivatio nominis: the name of this species is dedicated to the French specialist on Geometridae, the highly respected M. Claude Herbulot † (19.02.1908–19.01.2006), who collected moths intensively in many places in Europe, Asia, Africa and South America.

Note. The single holotype specimen is rather worn with completely worn fringes on all wings.

Unfortunately, the ductus seminalis is not visible on the bursa, but most likely extends from the membranous diverticulum.

Eupithecia nervosa Mironov & Galsworthy, **sp. n.** (Fig. 6)

Description. Wingspan 21 mm; fore wing 11.5 mm. Labial palpi covered with mixed brown and pale whitish brown scales. Head pale whitish brown. Notum pale whitish brown with broad, brown transverse band at front. Fore wing elongate but quite broad, with slightly arched costal margin, evenly curved terminal margin and rather rounded apex; ground colour pale brownish grey; transverse lines narrow, rather inconspicuous; antemedian line oblique, right

angled onto costa; median line oblique, sinuate, sharply angled onto costa behind discal dot; Sc, R and Cu veins covered with black scales between antemedian and median lines; postmedian line oblique, twice angled near costa, forming a blackish brown costal spot and with a series of blackish dashes on the veins; terminal area slightly darker, darkest near apex, with black dashes between veins near apex and also with a broad, but indistinct pale, whitish brown, wavy subterminal line; discal dot very small, rounded, blackish; terminal line narrow, blackish brown, interrupted by the veins; fringes chequered brown and pale whitish brown. Hind wing relatively broad, angulate; ground colour paler, light greyish brown; transverse lines brownish, marked along anal margin only; terminal area slightly darker with pale, dentate subterminal line, well marked in tornal part; discal dot paler, ovate-acuminate; terminal line and fringes as fore wing. Abdomen greyish brown with black lateral stripes.

Female genitalia (Fig. 26). Bursa copulatrix small, globular, completely and densely covered with small spines. Ductus bursae elongate and broad, sharply tapered to colliculum, sclerotized especially between corpus bursae and base of ductus seminalis on right side, with longitudinal striations at base and a sclerotized diverticulum near the base on the left side, and a small patch of sparse small spines in the middle. Ductus seminalis long and broad, curved backwards, broadly attached to central part of ductus bursae on right side. Colliculum collar-like, short and broad, sharply tapered posteriorly. Antrum membranous, covered with numerous pores near base. Tergite A8 narrow and elongate, narrowing in central part, with sclerotized anterior margin, some setae on posterior margin and rounded posterior corners. Anterior and posterior apophyses elongate, thin; posterior apophyses hardly expanded or flattened at apices. Papillae anales rather large, broadened at base and sharply tapered to apices, covered with long setae.

Male unknown.

Range. Nepal. Known from Katmandu area.

Similar species. On the basis of the structure of the female genitalia, this species, like *himalayata* above, is related to the group around *E. rajata* Guenée, [1858]. Externally it is similar to *E. mustangata* Schütze, 1961, but can be distinguished from this latter by the smaller discal dots on the fore wings, the rather angulate hind wings without concave terminal margins, and the darker hind wings lacking a series of dark dashes on the veins. The female genitalia are similar to those of *E. fessa* Mironov & Galsworthy nom. n., which will be described below. *E. nervosa* is however readily distinguishable from it by the presence of a sclerotized diverticulum on the ductus bursae.

Holotype ♀: Nepal, 20 km SSE Katmandu, Route du Phulchoki, 2,400 m, 4. x. 1983, C. Herbulot, Mironov slide no. 529♀ (coll. Herbulot in ZSM).

Eupithecia spinibarbata Mironov & Galsworthy, **sp. n.** (Fig. 7)

Description. Wingspan 19 mm; fore wing 9.5 mm. Labial palpi and head covered with dirty white scales. Notum darker, pale brownish grey. Fore wing elongate, narrow with slightly arched costal margin, evenly curved terminal margin and with narrow apex; ground colour pale whitish grey, with terminal area generally darker, a light grayish brown; transverse lines lightly marked, very narrow, slightly sinuate, oblique, and sharply angled and broadened onto costa forming small dark, grayish brown costal spots; median line single, postmedian line triple, with a series of short dark dashes on the veins; terminal area with distinct, fine, wavy white subterminal line; discal dot small, but well marked, ovoid; terminal line narrow, blackish, interrupted by veins; fringes distinctly chequered whitish grey and darker, brownish grey. Hind wing angulate, paler, slightly darker along anal and terminal margins, with conspicuous

transverse lines forming a series of dark dots on the veins; discal dot very small, pale, rounded; terminal line and fringes as fore wing. Abdomen shiny, pale ash grey with short and narrow dark brown lateral stripes on the fifth and sixth abdominal segments.

Male genitalia (Fig. 28). Uncus stout, elongate, pointed at apex, and when viewed laterally, biapical. Valva parallel sided, with dorsal margins slightly arched near base only and with broadly rounded apices, asymmetrical: both valvae with sacculus heavily sclerotized, left valva with a short, hook-like, heavily sclerotized medial process and a shallow curved hollow distad of it on the ventral margin; right valva with ventral margin slightly sinuate, and sacculus terminating in a small, rounded, heavily sclerotized process. Vinculum short and narrow, trapezoid, with shallow medial hollow. Papillae on the anterior arms of labides long and thin, tapered to apices, covered with sparse setae, longer on the apices. Aedeagus stout, slightly shorter than length of valva. Vesica covered with numerous denticules, armed with two horn-like cornuti (one short and stout, with broadened base, the other longer, slim, curved), and with one elongate, folded, H-shaped cornutus and one smaller, crumpled, irregular cornutus near ductus ejaculatorius base. Sternite A8 peg-like, broad, broadened medially, more sclerotized in posterior half, especially along lateral margins near apex, with two short and blunt, slightly asymmetrical and diverging sclerotized apical horns; basal and apical hollows narrow and shallow.

Female genitalia (Fig. 30). Bursa copulatrix ovoid, swollen on right side, sclerotized, covered with very dense small spines at base bordered by a circular, heavily sclerotized and multiply dentate band, with a patch of large, stout spines in the middle on the left side and also with a large patch of smaller, slim spines in the posterior half from the middle to the colliculum. Ductus bursae not expressed. Ductus seminalis broadened at base, attached to central part of corpus bursae on dorsal side. Colliculum collar-like, relatively short and broad. Antrum short and broad, membranous but covered with numerous pores. Tergite A8 small, almost quadrate, slightly broadened at base, with sclerotized anterior margin and rounded posterior corners. Anterior and posterior apophyses short and thin, tapered to apices. Sternite A8 unique, heavily sclerotized, large and broad, trapezoid, broader near base, with strongly rounded corners. Papillae anales small, short and rounded, covered with short setae.

Range. India. Darjeeling.

Similar species. On the basis of the structure of the female genitalia, this species belongs to the *propagata* group (the *inepta-sacrosancta* group of Vojnits 1984). Externally it is rather more similar to the European *E. dodoneata* Guenée, [1858]. The female genitalia are also very distinctive: they have the patch of large, stout spines at the middle of one side of the bursa copulatrix which is characteristic of the *propagata* species-group, but are unique in also having a dentate band round the bursa, and in the heavily sclerotized eighth sternite. The male genitalia, with asymmetrical valvae, are most unusual within the genus.

Holotype ♀: [India], Darjeeling, Mackenzie coll. (no date), BM Geometrid slide no 21990 (BMNH). Paratype ♂: same details, BM Geometrid slide no 21991 (BMNH).

Note: The two type specimens are undated, but were probably collected in the early 20th century.

Eupithecia fibigeri Mironov & Galsworthy, **sp. n.** (Fig. 8)

Description. Wingspan 16.5–20.5 mm; fore wing 9-11 mm. Labial palpi and frons brownish grey or brown. Vertex and notum paler, pale brownish grey or whitish grey. Fore wing rather elongate and narrow, costal margin slightly arched, terminal margin oblique, evenly curved,

apex narrowly rounded; ground colour pale brownish grey; transverse lines distinct, narrow, oblique, obtusely curved onto costa, brown, the postmedian line also angled close to costa; terminal area with three darker, brown blotches (apical, medial between M_1 and M_3, tornal) and a series of blackish brown marginal hatches between veins; discal dot relatively large, oblique, ovoid, black; terminal line narrow, blackish brown, interrupted by veins; fringes distinctly chequered pale brownish and brown. Hind wing elongate, ovoid; ground colour slightly paler, brownish grey; transverse lines conspicuous, brown, well marked along anal margin only; terminal area darker, brown near tornus with wavy, whitish subterminal line; discal dot smaller and paler, comma-like or ovoid, brownish; terminal line and fringes as fore wing. Abdomen pale brownish grey with darker brown two first segments and with lighter last segment.

Male genitalia (Fig. 29). Uncus short and bell-shaped, hooked at apex, uniapical. Valva broad, elongate, with slightly bowed dorsal margin, evenly curved ventral margin and narrow apex; sacculus lightly sclerotized. Vinculum short and moderately broad, semicircular. Papillae on anterior arms of labides thin, elongate, slightly tapered and covered with short setae at apices. Aedeagus stout, shorter than length of valva. Vesica armed with one straight, heavily sclerotized, horn-like cornutus about one half length of aedeagus, one long, narrow, plate-like cornutus with a sclerotized anterior arm, hooked at the apex, and one large, folded, round cornutus near ductus ejaculatorius base. Sternite A8 with two long, narrow, almost parallel, apical arms, connected with each other by a short and narrow band at base; basal hollow shallow; apical hollow very deep, relatively broad, membranous.

Female unknown.

Range. Nepal. Known from the vicinity of Jomson (Prov. Dhaulagiri).

Similar species. This species is related to *E. subfuscata* (Haworth, 1809). It is externally similar to the Taiwanese *E. acutipapillata* Inoue, 1988, but on the whole smaller and paler, with more distinct transverse lines on the fore wings. The male genitalia of *E. fibigeri* sp. n. are similar to those of the latter species in the short and stout uniapical uncus, the shapes of valva, vinculum, papillae on the anterior arms of labides, and the eighth sternite. However, the presence of a large, straight, heavily sclerotized horn-like cornutus on the vesica distinguishes this new species from *E. acutipapillata*.

Holotype. ♂, Nepal, 8 km SE Jomson, Thadung, 3,500 m, 7. viii. 1996, leg. M. Fibiger (coll. Fibiger). Paratypes. 4♂♂, same locality and date (coll. Fibiger; 2 paratypes in ZISP); 1♂, same locality, 11. viii. 1996, leg. M. Fibiger, Mironov slide no. 620♂ (coll. Fibiger).

Note. The shape of the eighth sternite in the male is variable. This variability is illustrated here on the basis of two dissected males. Three specimens among the paratypes have abdomens damaged by insect pests.

Derivatio nominis: The name of this species is dedicated to the specialist on Noctuidae Mr Michael Fibiger (Sorø, Denmark), who has collected moths intensively in Nepal and many other countries of Europe, Asia and Africa.

Eupithecia filia Mironov & Galsworthy, **sp. n.** (Fig. 9)

Description. Wingspan 17.5 mm; fore wing 9.5 mm. Fore wing rather elongate, with slightly arched costal margin, evenly curved terminal margin and narrowly rounded apex; ground colour with brown and yellowish elements; transverse lines oblique, sinuate, sharply angled near costa; basal area brown divided by yellowish stripe; basal half of medial area brown; two medial transverse lines narrow, sinuate, sharply angled from discal dot onto costa; postme-

dial line rather evenly curved onto costa, with broad, dark brown inner shade; terminal area brown with two lighter yellowish brown blotches (apical and medial), also with distinct, white, wavy subterminal line forming a distinct, relatively large, white tornal spot; discal dot rather large, pear-shaped, black, with ochreous blotch beneath; terminal line narrow, blackish brown, interrupted by veins; fringes chequered dark and light ochreous brown. Hind wing angulate, with shallow medial hollow in terminal margin; ground colour lighter, whitish brown; basal area brown along anal margin; transverse lines brownish, distinct along anal margin only; terminal area darker, especially near tornus, with dentate whitish subterminal line; discal dot distinct, oblique, elongate and narrow, blackish brown; terminal line and fringes as fore wing.

Female genitalia (Fig. 31). Bursa copulatrix very small, narrow and elongate, slightly curved, tapered to anterior end, densely covered with relatively small spines along left and right sides, which connect with each other near base, forming a V-shaped spiniferous area. Ductus bursae not clearly expressed. Ductus seminalis relatively broad, especially in medial part, curved, attached to posterior half of corpus bursae near base of colliculum on right side. Colliculum collar-like, relatively broad, elongate. Antrum broad, membranous. Tergite A8 large, broad, rectangular. Anterior and posterior apophyses moderately thick and long, slightly expanded and flattened at apices. Papillae anales large, narrow and elongate, tapered to apices, heavily sclerotized, covered with sparse long setae and dense short and stout, spinelike setae directed forewards.

Male unknown.

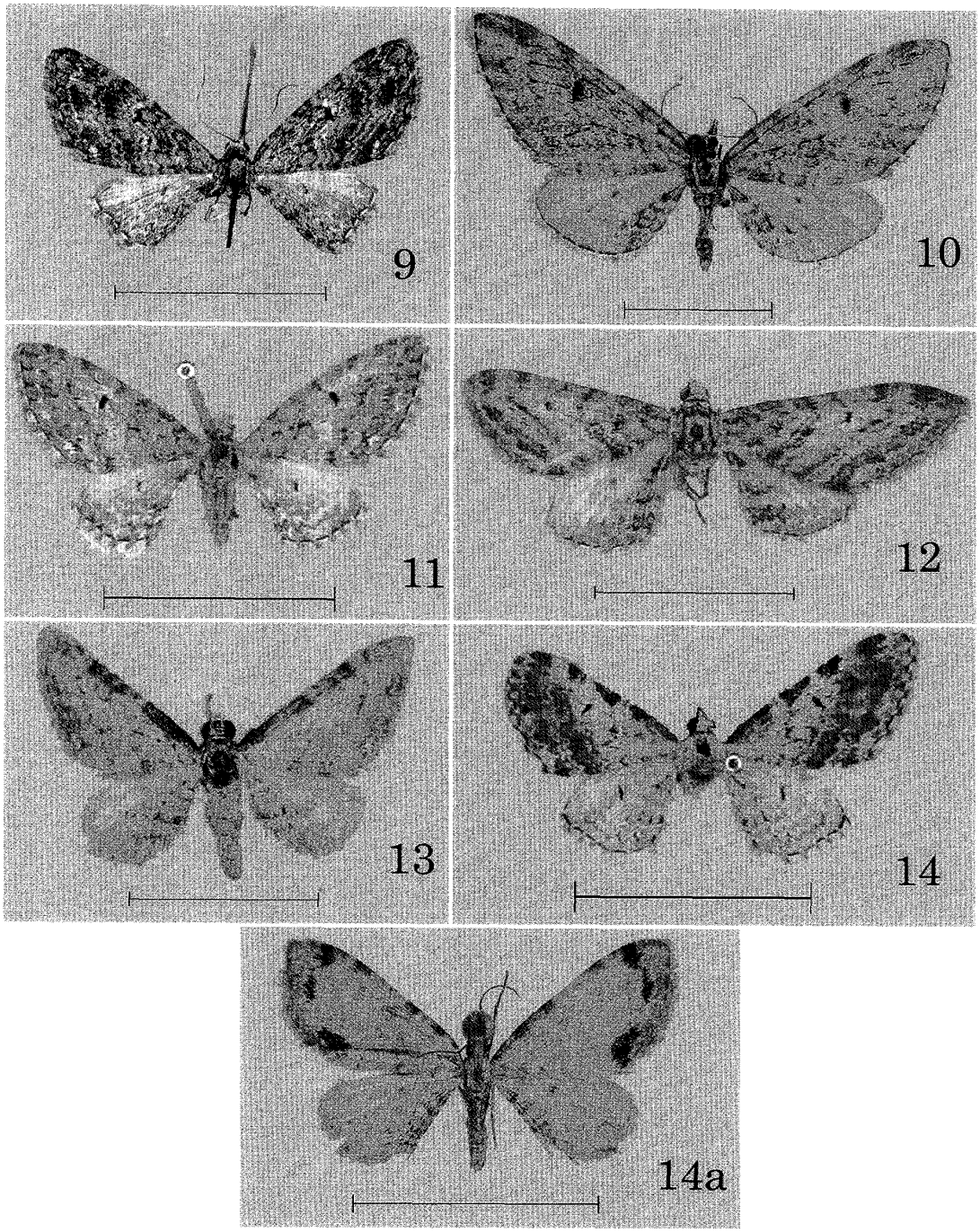
Range. Nepal. Ganesh Himal.

Similar species. Based on the structure of the female genitalia, this species belongs to the *lanceata* group. However, it is not externally similar to any other known Asian species belonging to this group. The distinctive maculation, and combination of dark brown, brown and light yellowish brown elements of pattern on the fore wings clearly distinguish this species from any other. The female genitalia have similarities to those of other allied species, such as the European *E. lanceata* (Hübner, 1825), *E. emendata* Vojnits, 1983 from Nepal, *E. habermani* Viidalepp & Mironov, 1988 (Far East Russia) and two Japanese species *E. takao* Inoue, 1955 and *E. shikokuensis* Inoue, 1980, but are easily distinguished from them, particularly by their small size. The presence of large, elongate and pointed, heavily sclerotized papillae anales in the female genitalia link *E. filia* particularly closely with *E. emendata* Vojnits.

Holotype ♀. Nepal, Ganesh Himal, 7 km W Godlang, 2950 m, 85°14′E, 28°10′N, 8. v. 1995, leg. Gy. Fábián & L. Ronkay, Galsworthy slide no GL22 (TTM).

Eupithecia laszloi Mironov & Galsworthy, **sp. n.** (Fig. 10)

Description. Wingspan 29.5 mm; fore wing 15.5 mm. Palpi porrect, white, the penultimate segment with many brown scales laterally. Frons, vertex, patagium and tegulae white. Thorax white with a broad dark brown band anteriorly. Abdomen white with many admixed golden and dark brown scales. Fore wing very elongate, costa slightly bowed, apex pointed, termen and dorsum evenly curved. Ground colour pale brown; transverse lines largely suppressed, with scattering of golden brown and darker brown scales, heavier in basal half of wing, and particularly marked along veins, especially anterior and posterior margins of discal cell, M_1 and M_2, and anal vein. Two patches of golden brown scales on costa, at three quarters and subtornally. Discal dot dark brown, elongate. Marginal line dark brown. Hind wing elongate; ground colour white, area posterior of discal cell marked with transverse brown bands, forming a distinct straight edge with white scales of rest of wing. Discal dot brown, rounded, smaller than on fore wing.



Figs 9–14a. *Eupithecia* adults (scale bar = 1 cm): 9– *E. filia* Mironov & Galsworthy, sp. n. (holotype); 10– *E. laszloi* Mironov & Galsworthy, sp. n. (paratype); 11– *E. singhalensis* Mironov & Galsworthy, sp. n. (paratype); 12– *E. kama* Mironov & Galsworthy, sp.n. (holotype); 13– *E. asema* Hampson (syntype); 14– *E. albifurva* Hampson; 14a– *E. idaeoides* Mironov & Galsworthy, sp. n. (holotype).

Female genitalia (Fig. 32). Bursa copulatrix large, globular, entirely covered with dense, smallish spines. Ductus bursae broad and membranous, with ductus seminalis broadly attached on right side, moderately broad and curling around bursa. Colliculum long, the two sides uneven in length, well sclerotized. Antrum membranous, broadening slightly. Eighth tergite transverse, well sclerotized, the posterior corners rounded. Apophyses anteriores notably short,

slightly hooked at tip; apophyses posteriores of more normal length but narrow. Papillae anales broad and rounded, covered with shortish setae.

Male unknown.

Range. Known only from Terhathum district in the extreme east of Nepal.

Similar species. The species probably belongs to the *proterva* group (Group B of Inoue, 1979). It is notable for its comparatively large size, which is comparable to *asempiterna* Inoue 2000, which is known from the same region. It is instantly distinguishable from the latter by the pattern of the hind wing, and in the female genitalia by the pattern of spining, which in *asempiterna* covers only about half of the bursa, but the whole of the posterior end, where the ductus is entirely lacking. The female genitalia are very similar to those of *E. peregovitsi*, Mironov & Galsworthy, 2009, but have a shorter colliculum and eighth tergite.

Holotype. ♀, Nepal, Koshi, Terhathum area, Tinjure Phedi, 2,900 m, 87°27′E, 27°12′N, 24. iii. 1996, leg. Csorba, Kovács & Ronkay, Galsworthy slide no GL8. Paratype. 1♀, Nepal, Koshi, Terhathum area, Sirumani, 2,950 m, 87°31′E, 27°15′N, 25. iii. 1996, leg. Csorba, Kovács & Ronkay (both coll. GL).

Derivatio nominis: this species is named after our good friend and eminent collector and student of Lepidoptera, especially Geometridae, Mr Gyula M. László (Budapest, Hungary).

Note. Both specimens are fairly worn. It is likely that the fore wing pattern would be clearer on fresh specimens.

Eupithecia singhalensis Mironov & Galsworthy, **sp. n.** (Fig. 11)

Description. Wingspan 18.5 mm; fore wing 9 mm. Labial palpi white on upper side, brown laterally. Head and thorax pale brown. Fore wing fairly broad, apex elongate and pointed, termen weakly curved and dorsum almost straight. Ground colour white with all markings pale to mid brown. Basal area well marked with a thick scattering of pale brown scales as far as antemedian line, which is marked in darker brown, and thrice angled, touching discal dot before reaching costa at a right angle. Median line parallel to it in dorsal half of wing, but converging with it and joining at discal dot. Postmedian generally parallel but angles less marked, and area basal of it shaded with mid brown scales. Rest of median area white, producing a narrow white fascia. Discal dot blackish brown, elongate. Exterior to postmedian, a line of faint white dots on veins. Terminal area generally mid brown, crossed by a well-marked white wavy line, culminating in a strong white tornal dot. Marginal line dark brown, with white dots between veins. Fringes strongly chequered white and mid brown. Hind wing ground colour as fore wing, but brown scales less extensive, making it appear paler than fore wing. Basal area suffused with mid brown scales; all transverse lines marked as far as discal dot with pale brown scales, the postmedian darkest and broadest. Discal dot small, slightly elongate. Marginal line and fringes as fore wing.

Female genitalia (Fig. 33). Bursa copulatrix small, globular, completely covered with dense small spines. Ductus bursae long, relatively broad, sclerotized, and more strongly sclerotized towards its base, with a patch of spinules in posterior half. Ductus seminalis slightly broadened at base, curved, attached to central part of ductus bursae on right side. Colliculum short, ovoid, plate-like. Antrum membranous, short and broad. Tergite A8 almost quadrate, with narrowly sclerotized anterior margin and rounded posterior corners. Anterior and posterior apophyses relatively short, thin, slightly expanded and flattened at apices. Papillae anales small, short, rounded, covered with medium-sized setae.

Male unknown.

Range. Sri Lanka.

Similar species. From the structure of the female genitalia, this species is likely to belong to the *lanceata* group (Mironov, 2003). The genitalia are superficially similar to those of *E. emendata* Vojnits, 1983, but are easily separated from them by the pattern of spining. Externally the species looks rather similar to a small specimen of *E. subfuscata* Haworth, 1809. So far as we know, no other *Eupithecia* species with this type of facies has been recorded from Sri Lanka, but firm diagnosis should be on the basis of genitalia.

Holotype ♀. Ceylon [Sri Lanka], Haputali, February 1907–112, BM Geometrid slide no. 22003. Paratype. 1 ♀, Ceylon [Sri Lanka], Uva, 2000ft, ex coll. G. C. Alston, Joicey bequest Brit. Mus. 1934–120 (both BMNH).

Eupithecia kama Mironov & Galsworthy, **sp. n.** (Fig. 12)

Diagnosis. Wingspan 25 mm; fore wing 11.5 mm. Palpi short and stout, brown with long white scales dorsally. Frons, patagium, tegulae and thorax mainly covered with pale brown scales, each with a broad white tip. Thorax with a darker brown transverse band close to anterior edge. Fore wing narrow and elongate, costa mostly straight, but abruptly curved at three quarters, apex pointed, termen and dorsum forming a continuous gentle curve. Ground colour white. Basal area suffused with brown scales. Antemedian double, right angled onto costa. Median not expressed. Postmedian double, straight, and more oblique than antemedian, acutely angled onto costa. Costal and dorsal areas with suffusion of brownish scales, particularly at points where transverse lines touch. Terminal area mid to dark brown, crossed by a transverse wavy white line, forming a strong white tornal patch. Marginal line dark brown. Fringes golden brown, not chequered. Discal dot brown, slightly elongate. Hind wing elongate, discal area shining white. Transverse lines marked with dark brown in terminal and anal areas. Discal dot faint. Marginal line and fringes as fore wing.

Female genitalia (Fig. 34). Bursa copulatrix oval, striate, membranous, the anterior part covered with spines. Ductus seminalis attached to bursa at posterior end on right side. Ductus bursae broad, parallel-sided, heavily sclerotized. Antrum abruptly broadened from ductus, very heavily sclerotized, divided in middle to form two lobes. Tergite A8 slightly elongate, its posterior corners rounded. Apophyses anteriores strong, curved inward; apophyses posteriores long, with a pronounced nodus near posterior ends. Papillae anales narrow, rather pointed, covered with short and medium setae.

Male unknown.

Range. S. India, Palni Hills.

Similar species. Based on the structure of the female genitalia, this species probably belongs to the *egenaria* species-group (Mironov, 2003). Externally, it more closely resembles some members of the *innotata* group (McDunnough, 1949), for instance *E. parallelaria* Bohatsch, 1893, but the ground colour is paler, and the shape of the postmedian distinct, and it lacks the pale tornal streak of the latter species. The female genitalia of *E. kama* sp. n. are similar to those of *E. vivida* Vojnits & De Laever, 1978, but the ductus bursae is longer and the papillae anales narrower, more elongate and more tapered towards the apices.

Holotype ♀. S. India, Palnis, Campbell, 1906–124, BM Geometrid slide no. 22004 (BMNH).

Eupithecia idaeoides Mironov & Galsworthy, **sp. n.** (Fig. 14a)

Diagnosis. A small species. Wingspan 16 mm; fore wing 9 mm. Labial palpi short, shorter than diameter of eye, covered, as also frons, with mixture of brown and light yellowish grey scales. Vertex and notum pale yellowish grey; neck with tuft of dark brown scales. Fore wing with slightly arched costal margin near base and apex, evenly curved terminal margin and rather narrowly rounded apex; ground colour pale grey with yellowish tinge; costal margin with four brown spots (basal, postbasal, antemedial and postmedial); antemedial transverse line weakly visible, broad, sharply angled onto costa; postmedial line evenly curved onto costa; terminal area with three reddish brown blotches, a large bean-shaped tornal one, an elongate and narrow medial one, and a broader costal one consisting of two connected blotches); discal dot not visible; terminal line narrow, brownish, interrupted by vein ends; fringe slightly chequered with light and dark grey with yellowish tinge. Hind wing ovoid, with evenly curved terminal margin; slightly paler, light grey with yellowish tinge; transverse lines oblique, brownish, well visible along anal margin; discal dot small, pale brown, rounded; terminal line and fringe as on fore wing. Abdomen unicolorous light yellowish grey.

Male genitalia (Fig. 32a). Uncus spade-shaped, membranous. Valva relatively short, shaped like an orange segment, with evenly curved ventral margin, slightly bowed dorsal margin at the base and narrowly rounded apex; sacculus lightly sclerotized. Vinculum large, slightly elongate and broad, rather tapered anteriorly. Papillae on the anterior arms of labides slightly curved, covered with relatively long setae along inner margins and at the apices. Aedeagus large, stout, equal to length of valva. Vesica armed with dense patch of four small stout horn-like cornuti, one plate-like, curved irregular cornutus near ductus ejaculatorius base, and a patch of denticules nearer to apex. Sternite A8 relatively large, with two long and narrow pincer-like apical rods, tapered to apices, and two narrow, shorter basal lobes; apical hollow large, deep and broad, membranous; basal hollow rather shallow and broad.

Female. See note below.

Range. India (West Bengal and Sikkim).

Similar species. This species from the *haworthiata* group (Vojnits, 1972) is externally more similar to an *Idaea* (Sterrhinae) than to any other species of *Eupithecia*. *E. idaeoides* sp. n. is distinctive by the unicolorous pale yellowish grey wings and the unique reddish brown terminal blotches on the fore wings. Apart from the uncus the male genitalia are closer to those of *Eupithecia ochracea* (Warren, 1888) than to other representatives of the *haworthiata* group. However, *E. ochracea* has a spine like tip to the uncus which is lacking in *idaeoides*. The presence of four short horn-like cornuti on the vesica of the aedeagus are unique within the *haworthiata* group.

Holotype ♂. Indien WB Darjeeling, Tigerhill, 2,400 m, 29–31. viii. 1988, leg. W. Thomas (ZFMK). Paratype. 1♂, Indien Sikkim, vic. Pelling, 1800 m, 27. viii. 1988, leg. W. Thomas, Mironov slide no. 675♂ (ZFMK); 1♀, Sikkim, 2000 [ft], ix. 1895, J. G. PILCHER, 97–31 (BMNH).

Note: the female specimen recorded above was discovered when this paper was already in press. The genitalia will be published at a later date.

Older species

Eupithecia asema Hampson, 1891 (Fig. 13)

Eupithecia asema Hampson, 1891, *Illust. Typical Specimens Lepid. Heterocera Colln. Br. Mus.* **8**: 31, 117, pl. 152, fig. 23.

Diagnosis: a very distinctive species with a generally yellow coloration, with well marked brown spots on the costa, a brown postmedial line, and a stong white wavy submarginal line. Hind wing very pale, with transverse lines marked in yellowish brown along anal margin only.

Male genitalia (Fig. 37). Uncus uniapical, narrow and somewhat elongate. Valva shaped like an orange segment, costa straight, ventral margin evenly curved, unmodified, and apex narrow but rounded. Vinculum broad and semicircular. Papillae on anterior arms of labides rather short, slightly expanded at apex, apical setae all short. Aedeagus slightly shorter than length of valva; vesica armed with one blunt subapical cornutus, its apical end clavate and tipped with sharp spines, a row of four stong teeth mounted independently on the vesica near its base, and two further elongate, blunt plates, one stouter than the other, nearer the base. Sternite A8 X-shaped, base with two broad lobes, and apex with two sclerotized horn-like arms. Basal and apical hollows moderate, of similar size.

Female: unknown.

Range: S. India, Nilgiri Hills.

Similar species: on the basis of the external facies, and the shape of the eighth sternite, this species belongs to a group related to *E. despectaria* Lederer, 1853. Externally it is similar in general coloration to *E. ochracea* Warren, 1888, from the Himalaya range, but is distinguished from it by the darker and sharper markings of the transverse lines and costa, and by the paler hind wing. The only other species with this general coloration known from the subcontinent are *E. brunneilutea*, Mironov & Galsworthy, 2004, and *E. leucostaxis*, Prout, 1926, also from the Himalaya range, but the former has much finer and more extensive transverse lines, and the latter has reduced transverse markings and subterminal rows of white dots on the fore wing. The male genitalia are similar to those of *ochracea*, but the ornamentation of the aedeagus vesica is quite distinct.

Material examined: 3♂, Nilgiris, Hampson Coll. 89–129, one bearing handwritten label "*Eupithecia* asema Type ♂"; 1♂, 3076 Nilgiris Hampson, Swinhoe coll. Brit. Mus. 26–239.

Note: Hampson did not specify type material in his description, but all four of the above specimens seem to have been collected by him. It is likely that he gave one of them to Swinhoe, and that his description was based on the first three, which must be regarded as syntypes. In his description he states that the specimens came from the 'Plateau' at 6700 feet, and were collected in October.

Eupithecia albifurva Hampson, 1907 (Fig. 14)

Eupithecia albifurva Hampson, 1907, *J. Bombay nat. Hist. Soc.* **18** (1): 49, pl. E, fig. 8.

Diagnosis: unlikely to be confused with any other species of *Eupithecia* known from the region. The combination of largely white basal and medial areas of the fore wing, with dark costal spots, and the well defined warm brown terminal area are extremely distinctive.

Female genitalia (Fig.39). Bursa copulatrix globular, densely covered throughout with small spines. Ductus bursae broadly attached to posterior end of bursa, broad anteriorly, then taper-

ing abruptly, and covered on dorsal side with an elongate triangle of larger spines. Ductus seminalis narrow, attached to ductus bursae on dorsal side. Colliculum not expressed. Antrum membranous, broadening posteriorly. Tergite A8 slightly transverse, lightly sclerotized, rounded at posterior corners. Apophyses anteriores and posteriores of average size, well sclerotized, the anteriores curled at tips, and the posteriores spatulate at tips. Papillae anales compact, relatively narrow, densely covered at apices in uniform short setae.

Male: unknown.

Range: Sri Lanka.

Similar species. This species appears to be closely related to *E. mundiscripta* (Warren, 1907), which ranges throughout lowland SE Asia to Taiwan and the upper montane zones of Sundaland, Sulawesi, Seram and New Guinea (Holloway, 1997). The facies is very similar in pattern, but much brighter and with stronger contrasts between the brown and pale areas, and larger and stronger costal spots on the fore wing. *E. mundiscripta* has many more dark scales in the basal areas of the fore and hind wings, giving a rather mottled pattern, whereas in *E. albifurva*, these areas are a clear shining white. In *E. mundiscripta* the fore wing postmedial is scalloped, but straight in *E. albifurva*. Both insects are similar in general coloration to members of the *haworthiata* species-group (Vojnits, 1972). *E. albifurva* is externally very similar to *E. bohatschi* Staudinger, 1897, from which it differs principally in the warmer brown coloration, and the paler hind wing, lacking in darker terminal area. The female genitalia are closely similar to those of *E. mundiscripta*, but differ in that the ductus bursae at its junction with the bursa has a clearly defined triangular patch of spining, whereas in *E. mundiscripta* there are only a few randomly scattered small spines in the area.

Material examined: 1♀, 'Type', Ceylon, de Mowbray 1904–139, '*Eupithecia albifurva* type ♀ Hampson'; 1♀, Maskeliya, Ceylon, January, ex coll. G.C. Alston, Joycey bequest Brit. Mus. 1934–20, BM Geometrid slide no. 20939; 1♀, Pattipola, Ceylon, 4. [19] 09, 3787G, Mackwood coll. B.M. 1927–341.

Note: although Scoble *et al.* (1999) record the type material for this species as 'Syntype(s) (♀)', Hampson in his description states that the specimen(s) came from de Mowbray and adds 'Type in BM'. Since only one specimen of the three above was already in the BMNH collection by the time of Hampson's description, and it fits his description exactly, besides being marked as type, probably in his handwriting, we think it should be regarded as a holotype.

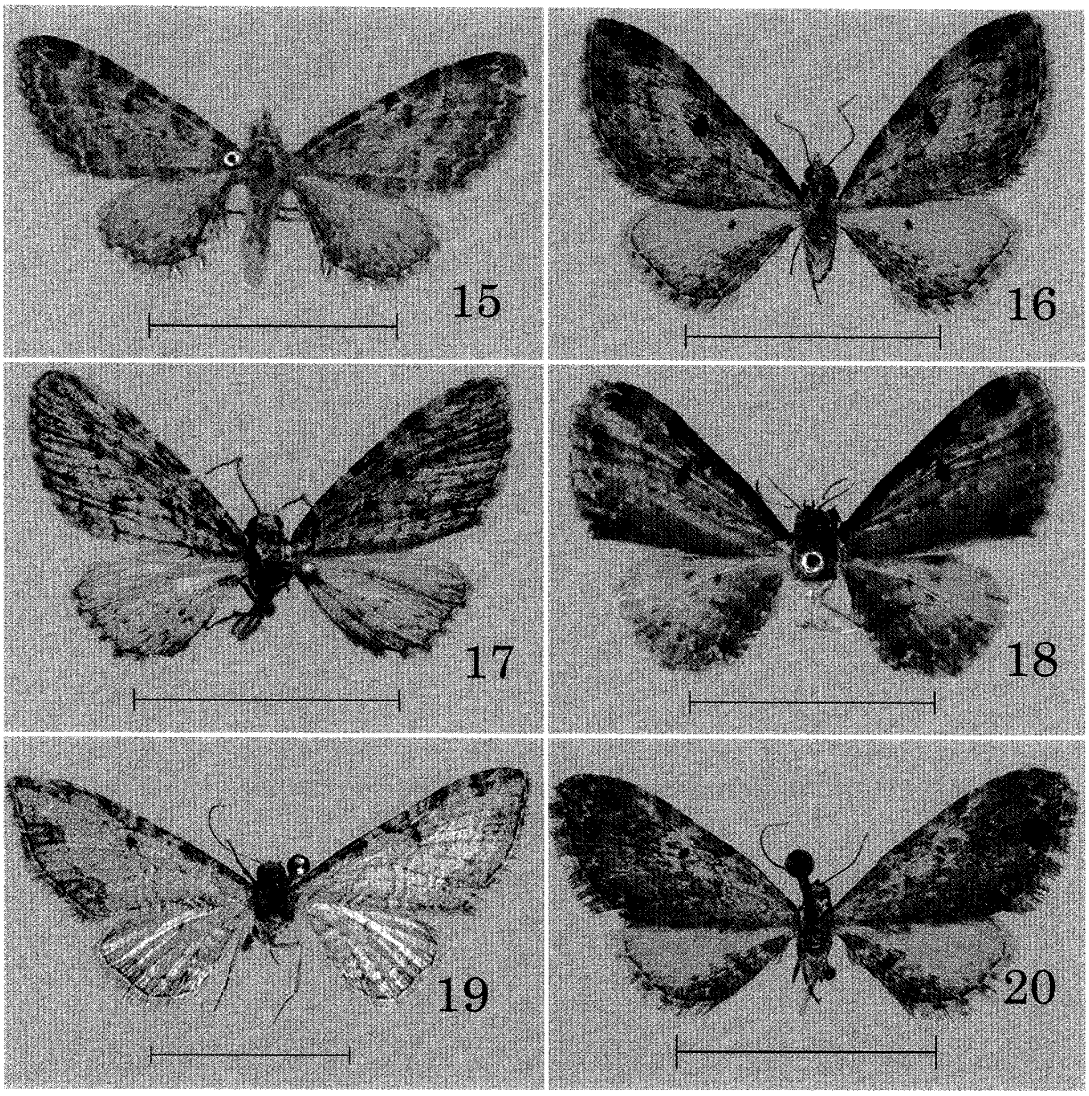
It is possible that *E. albifurva* should be regarded as no more than an insular subspecies of *E. mundiscripta*, but it would be premature to reach this conclusion without examining the hitherto unknown male of *E. albifurva*.

Eupithecia infestata Swinhoe, 1890 (Fig. 15)

Eupithecia infestata Swinhoe, 1890, *Proc. Zool. Soc. Lond.* **1889** (4): 430.

Diagnosis: wing span 21 mm. A rather uniformly brown species, with hind wings as dark as fore wings. Ground colour dark reddish brown, with reduced transverse lines, the postmedian showing most clearly as a row of dark dashes on the veins with a narrow pale fascia on the outside, doubly angled near the costa. All transverse lines marked by dark patches on costa. Subterminal pale wavy line complete and prominent on both wings. Fore wing discal dot dark and elongate.

Male genitalia (Fig. 36). Uncus biapical, rather elongate. Valva unmodified, broad; the costa bowed, apices narrow but rounded. Vinculum with a deep hollow in centre. Papillae on ante-



Figs 15–20. *Eupithecia* adults (scale bar = 1 cm): 15– *E. infestata*, Swinhoe; 16– *E. coccinea*, Vojnits (paratype); 17– *E. apparatissima* Vojnits; 18– *E. vojnitsi* Inoue; 19– *E. costipicta* Warren, (holotype); 20– *E. discolor* Vojnits (paratype).

rior arms of labides narrow, parallel sided without apical swelling, and with short setae at tip. Aedeagus broad and long, longer than length of valva; vesica with a vague undefined sclerotization near the base and one very long sharp cornutus, with a serration on one side at one third from base. Sternite A8 long and narrow, tapering towards apex, with a large X-shaped sclerotization, the two basal arms widely splayed, and the shorter apical arms close together. Basal hollow deep, apical hollow narrow and shallow.

Female genitalia (Fig. 38). Bursa copulatrix elongate and narrow, with irregular rows of large spines, increasing in size towards anterior end, where they form an inchoate mass; a large membranous diverticulum at anterior end of bursa. Ductus seminalis narrowly attached to ductus bursae very close to colliculum. Ductus bursae a seamless continuation of bursa, membranous, but with a tract of very small spines along one side. Colliculum short and narrow. Antrum very short. Tergite A8 square with rounded posterior corners. Apophyses of average length, anteriores sharp and straight, posteriores rather narrow with unenlarged tips. Papillae anales narrow, covered with short and a few longer setae.

Range: hills of southern India.

Similar species: this species belongs to the *undata* group (Mironov, 1990), and is closely related to *E. impavida* Vojnits, 1979 (= *pacifica*, Inoue, 1980). It is externally very similar to the latter, though generally rather larger, but is best distinguished by the genitalia. It is also very similar externally to *E. rajata* Guénée, 1858, but has larger discal dots, and lacks the clearly expressed costal spots of the latter. In the male, the shape of the eighth sternite is diagnostic, and quite unlike that of any other known species of *Eupithecia*. The female genitalia are rather similar to those of *impavida*, but differ in having a very short antrum, and a narrower bursa. Its range is not known to overlap with *impavida*.

Material examined: 1♂, 'Type', 1236, Nilghiris 6700', 8.87, Hampson, *Eupithecia infestata* Swinhoe type ♂, Vojnits gen prep 19297, BM 20121, **lectotype** here designated. 1♀, 'allotype', 1236, details as holotype, '*Eupithecia infestata* Swinhoe type ♀'; 1♂,3♀, Nilghiris 6700', Sept, Hampson, Moore coll., BM 94-106, Vojnits dissections 19299 and 19298, BM 20122 and 20123; 1♀, Nilgiris, Rothschild bequest 1939-1; 2♀, Nilghiris, Hampson collection 89-129.

Note: in his description, Swinhoe gives the following information:"Mbow, October; Poma and Khandalla, October; Nilgiri Hills, 6,800 ft, June to September. Numerous specimens." It is not possible to be certain which of the above specimens were available to Swinhoe. Very probably, all those collected by Hampson may have been seen by him, since Hampson was collecting in the area in 1888. But it is not clear that all the specimens seen by Swinhoe are in the BMNH series. In view of the uncertainties, we hereby designate the specimen above labelled 'type' in the BMNH series as lectotype. Both the males in the series were loaned to and dissected by Dr Vojnits in the 1980s: unfortunately the preparations are unstained and badly mounted, making it difficult to distinguish some of the details.

Eupithecia fessa Mironov & Galsworthy, **nom. n.**

[Replacement name for *Eupithecia pallescens* Inoue, 2000, preocc., *nec* Dietze, 1910.]

Eupithecia pallescens Inoue, 2000, Tinea **16** (Suppl. 1): 38, pl. 166, fig. 4; fig. 1312. Holotype ♂ (NSMT), [NE India]: Darjeeling, 2,100 m. [Junior primary homonym of *Eup (ithecia) sinuosaria* f. *pallescens* Dietze, 1910.]

The name *pallescens* was preoccupied by Dietze (1910) as *Eup (ithecia) sinuosaria* f. *pallescens* Dietze, 1910 (pl. 73, fig. 385) from Aksu, Takla-Makan desert (NW China), which was also mentioned in the second volume of the classic folio of Dietze (1913) on pages 110 and 166 (index). The Nepalese species *E. pallescens* Inoue, 2000 was described on the basis of two males only. We have found a female specimen in the collection of Mr M. Fibiger, and include here a description and illustration of the female genitalia of this rare species.

Female genitalia (Fig. 41). Bursa copulatrix small, ovoid, heavily sclerotized, completely and densely covered with very small spines. Ductus bursae elongate, slightly tapered posteriorly and more strongly sclerotized along right side, with a small patch of sparse small spines near base of ductus bursae and colliculum. Ductus seminalis very long and broad, broadly attached to ductus bursae near base of colliculum on left side. Colliculum collar-like, rather short and narrow. Antrum long, membranous, covered with numerous pores near tergite A8. Tergite A8 rectangular, narrow and elongate, with a medial hollow in the sclerotized anterior margin and with rounded posterior corners. Anterior and posterior apophyses relatively thin, elongate; posterior apophyses expanded and flattened at their apices. Papillae anales narrow, elongate, covered with setae.

Examined type material: ♂, India, West Bengal, Darjeeling, 2,100 m, 9. xi. 1981, M. Owada

leg., Inoue slide no 14141♂ (holotype of *E. pallescens* Inoue, 2000; NSMT).

Other material: 1♀, Nepal, Centr., N Ganesh Himal, Nesim, 2,200 m, 23.x.1995, leg. M. Fibiger, Mironov slide no 626♀ (coll. Fibiger).

Eupithecia lactibasis Inoue, 2000

Eupithecia lactibasis Inoue, 2000, *Tinea* **16** (Suppl. 1): 34, pl. 165, fig. 22; fig. 1340.

This is a rare Himalayan species from the "*haworthiata*" group which was described on the basis of a single female from Darjeeling (NE India). In external appearance it is similar to *E. sinicaria* Leech, 1897, but distinguished from this latter by the more pointed fore wing, the presence of sharp angle in the postmedial transverse line near the costa, the presence of black blotch near the tornus, the absence of brown in the posterior part of the medial area, and the more angulate hind wings with paler coloration and less clear and dark wavy transverse lines. We have discovered further material of this species in various collections, including a male, and the male genitalia are described and illustrated here for the first time. In comparison with *E. sinicaria* the uncus is narrower and more pointed to the apex, the valva narrower with more obtuse apex, the papillae on the anterior arms of labides shorter and broader, and the aedeagus shorter and narrower.

Male genitalia (Fig. 45). Uncus plate-like, membranous, slightly sclerotized in basal part, elongate, spade-shaped. Valva shaped like an orange segment, with evenly curved ventral margin and rounded apex; sacculus lightly sclerotized. Vinculum relatively short and narrow, with shallow medial hollow. Papillae on anterior arms of labides relatively short and broad, with broadened bases, covered with medium-sized setae and long setae at apices. Aedeagus slim, elongate and very narrow, with two elongate and narrow hirsute lateral lobes at posterior end; shorter than valva length. Vesica armed with one very small, V-shaped cornutus near ductus ejaculatorius base. Sternite A8 lyre-shaped, with two apically blunt sinuate arms, joined by a narrow basal band; basal lobes and accordingly basal hollow are absent; apical hollow membranous, narrow and very deep.

Range. NE India (Darjeeling), Nepal.

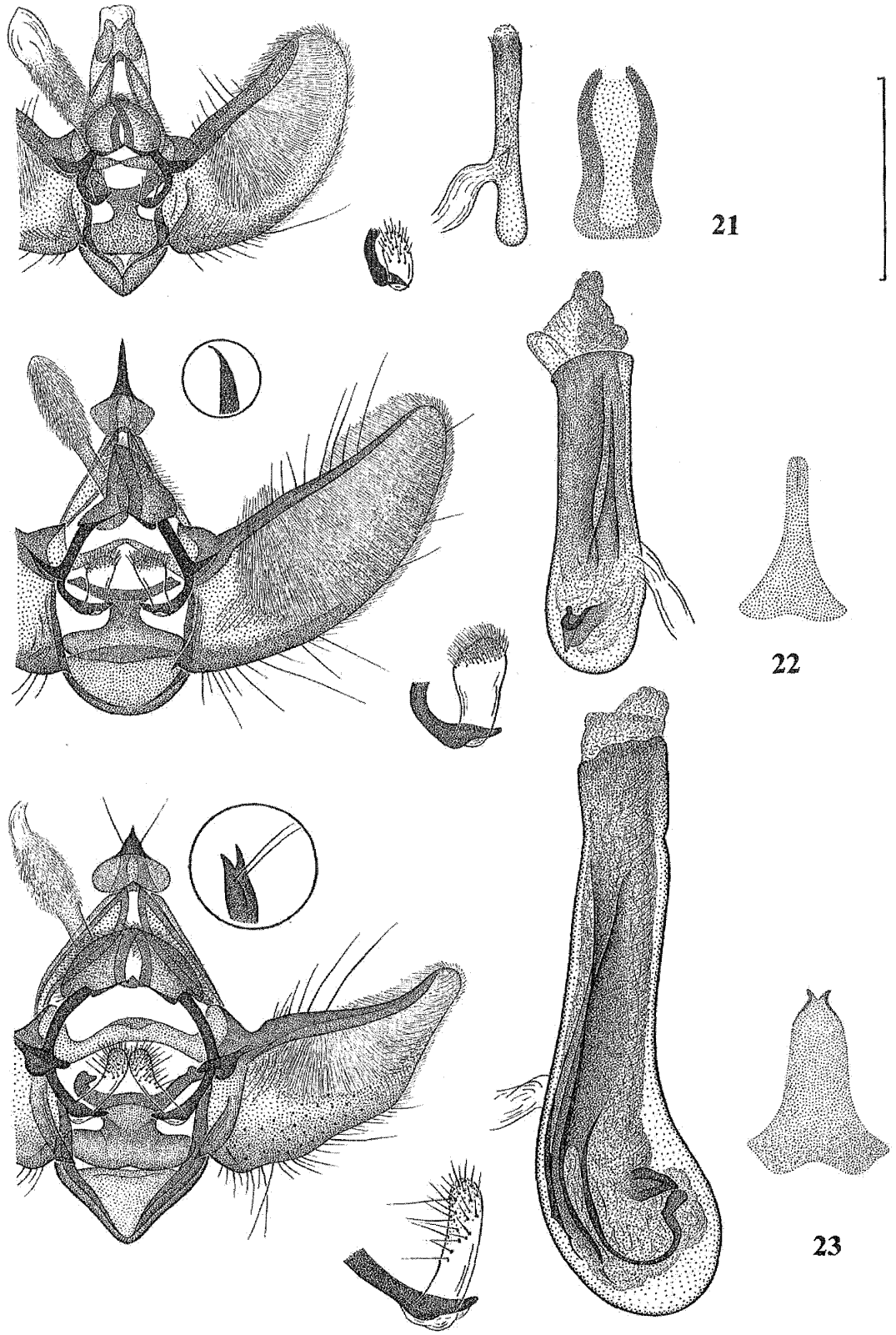
Examined type material: ♀, Darjeeling, 6 mile village, 2,050 m, India, 25. iii. 1986, W. Thomas (leg.), Inoue slide no. 14117♀ (holotype, coll. H. Inoue in BMNH).

Other material: 1♀, Khasis, April 1897, Nat. Coll., "*Tephroclystia rufipicta* Hmpsn.", Rothschild Bequest B. M. 1939-1, Geometridae genitalia slide no. 20943♀ (BMNH); 1♂, Nepal, Annapurna Himal, 2 km E Ghorepani, 2,900 m, 83°48′E, 28°24′N, 7.x.1994, leg. Csorba & Ronkay, Mironov slide no. 625♂ (TTM); 1♀, Nepal, Koshi, Terhathum area above Gorja, Tshisopani, 87°37′E, 27°21′N, 2,600 m, 20. x. 1996, leg. Gy. M. László & G. Ronkay (coll. GL).

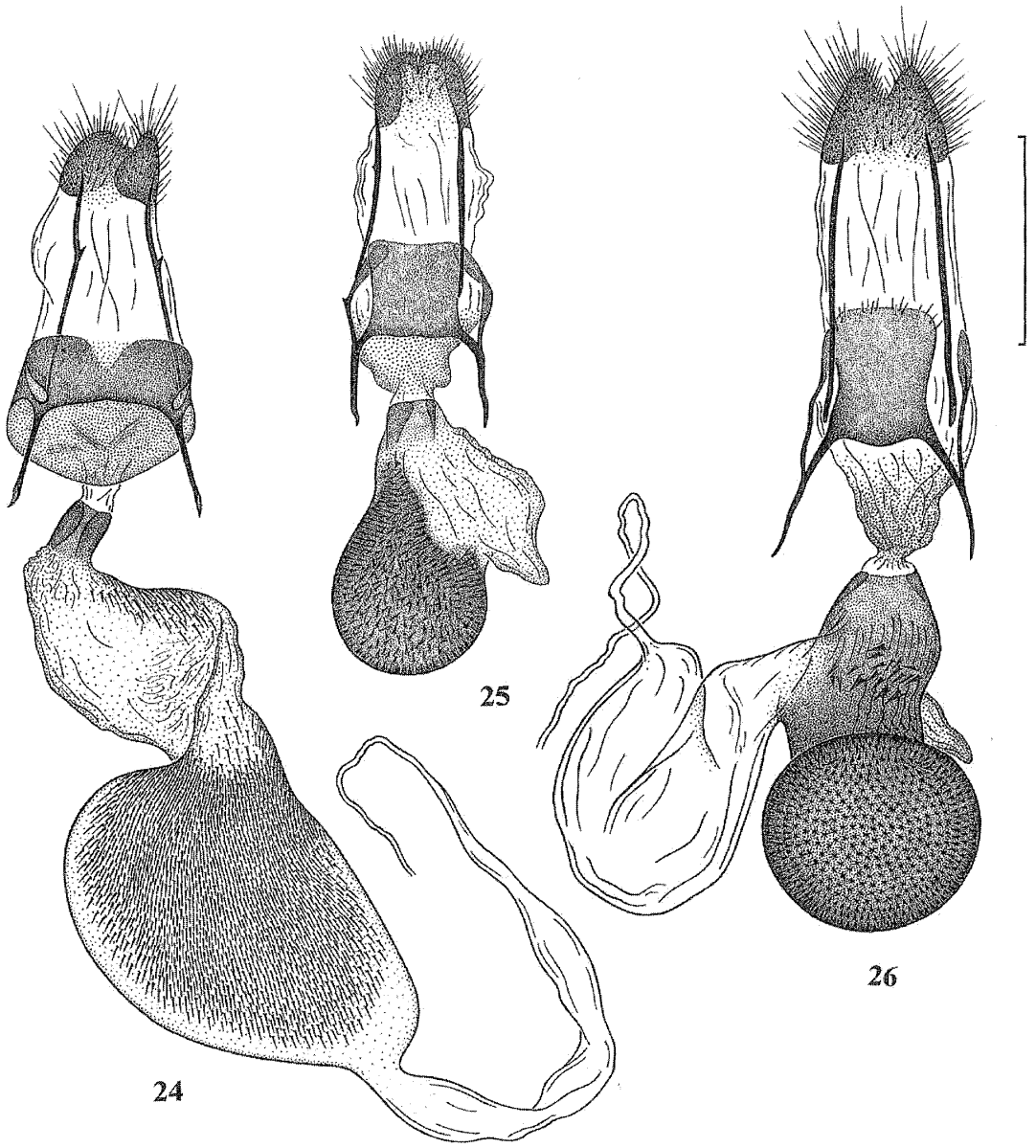
Eupithecia coccinea Vojnits, 1981 (Fig. 16)

Eupithecia coccinea Vojnits, 1981, *Acta zool. Acad. Sci. hung.* **27** (1-2): 224. Holotype ♂ (ZSM), Nepal: Prov. Nr. 2, East Jiri, 2000 m, not male genitalia.
Eupithecia liberata Inoue: 2000, *Tinea* **16** (Suppl. 1): 35 (description of female genitalia), fig 1342 [misidentification].

So far as we can determine, the description of *E. coccinea* as a new species by Vojnits was correct (Vojnits, 1981). However, the descriptions and illustrations of the male genitalia of this species were apparently included in error by Vojnits (1981: 224, and figs 8, 9), since they do not correspond to the genitalia preparation of the holotype of *coccinea*: in fact they belong to a different species, *Eupithecia concinna* Vojnits, 1983, described in a later paper, presumably confused because of the similarity of names. We therefore include in this paper a rede-



Figs 21–23. Male genitalia of *Eupithecia* species (scale bar = 1 mm; with sternite A8; lateral view of uncus and papillae on the anterior arm of labides enlarged). 21– *E. lusoria* Mironov & Galsworthy, sp. n.; 22– *E. rulena* Mironov & Galsworthy, sp. n.; 23– *E. superata* Mironov & Galsworthy, sp. n.



Figs 24–26. Female genitalia of *Eupithecia* species (scale bar = 1 mm). 24– *E. rulena* Mironov & Galsworthy, sp. n.; 25– *E. claudei* Mironov & Galsworthy, sp. n.); 6– *E. nervosa* Mironov & Galsworthy sp. n.

scription and illustrations of the male genitalia of *E. coccinea* Vojnits, 1981. Vojnits' slide no 10669 of the female genitalia of *E. coccinea*, taken from the female paratype, is deposited in the collection of the Hungarian Natural History Museum (Budapest), and we have not yet had the chance to study it. We have however a female specimen from Nepal in the series studied by Professor Inoue, which is an excellent match for male material of *coccinea* from Nepal, and we believe it to be the true female of this species. The female genitalia of this species were erroneously illustrated in his fig. 1342 by Inoue (2000) as those of *liberata* (see entry under *liberata* below). The female genitalia illustrated by Vojnits (1981, fig 8) for *coccinea* are also quite different, and appear to belong to a species from the *egenaria* group (Mironov, 2003).

Male genitalia (Fig. 48). Uncus slim, elongate, biapical, its ventral process considerably shorter than the dorsal one. Valva short and broad, with slightly bowed dorsal margin, broad and obtuse apex and also with sclerotized, broad and slightly prominent medial prominence on ventral margin; sacculus sclerotized. Vinculum short and broad, rounded. Papillae on anterior arms of labides thin, elongate, covered with sparse short setae, mainly at apices. Aedeagus relatively short, slightly shorter than length of valva. Vesica armed with three slim, relatively short horn-like cornuti (two apical, of which one straight and the other larger, and slightly curved; the third medial and straight), and also with a narrow, elongate, folded, U-shaped cornutus with two anterior arms (one with a row of small teeth along outer margin and the other longer, connecting with a large, irregular, anchor-shaped cornutus near ductus ejaculatorius base). Sternite A8 lightly sclerotized, relatively narrow and elongate, peg-like, with two narrow, parallel arms, tapered and sclerotized at apices; basal hollow shallow; apical hollow membranous, narrow and deep.

Similar species. Based on the structure of the male genitalia, *E. coccinea* may well belong to the *propagata* group (the *inepta-sacrosancta* group of Vojnits, 1984). The male genitalia lack a clear flange, but are otherwise similar to those of *E. laudabilis* Vojnits, 1984. As is usual in this group, the pattern of cornuti in the vesica is distinct and characteristic.

Examined type material: ♂, Nepal: Prov. Nr. 2, East Jiri, 2,000 m, 12.viii.1964, leg. W. Dierl, ZSM slide no G10621 (holotype of *E. coccinea* Vojnits, 1981, ZSM); 1♂, same locality, 10. viii. 1964, leg. W. Dierl, ZSM slide no G10646 (paratype of *E. coccinea* Vojnits, 1981, ZSM).

Other material: 2♂♂, Nepal, Centr., N. Ganesh Himal, Nesim, 2,200 m, 23. x. 1995, leg. M. Fibiger, Mironov slide no 640♂ (coll. Fibiger); 1♀, (Lama Hotel 2,390 m), Langtang Himal, Bagmati Zone, 13. viii. 1993 leg. Nakajima Hideo, bearing paratype label of *Eupithecia liberata* Inoue, Inoue slide no 16934 (BMNH).

Eupithecia liberata Inoue, 2000

Eupithecia liberata Inoue, 2000, *Tinea* **16** (Suppl. 1): 35, pl. 165, fig. 24; figs 1301 and 1342.

This species was described on the basis of a female holotype and a number of male and female paratypes. The holotype was left undissected, and the genitalia of one of the female paratypes illustrated (fig. 1342). We have now dissected the holotype specimen in BMNH, and discover that its genitalia are quite different from those illustrated, and that the paratype specimen in question is not referable to *liberata*. In fact, we believe it to be the female of *coccinea* Vojnits (see entry above). All the other paratypes are true *liberata*. We therefore redescribe the female genitalia of *liberata* below.

Female genitalia (Fig. 42). Bursa copulatrix very small, membranous, ovoid, with two small membranous, thick-walled diverticula (one tapered basally and the other on the left side broader and blunt), covered with dense spinules in the right half and a row of the same spines along the left side from base to colliculum. Ductus bursae short, with short longitudinal striations. Ductus seminalis long, medially broad; attached to ductus bursae near colliculum on right side. Colliculum collar-like, elongate and relatively broad. Antrum short and broad, membranous. Tergite A8 large, rectangular, width longer than length, with rounded posterior corners. Anterior and posterior apophyses relatively long and thick, slightly expanded to apices, especially anterior apophyses. Papillae anales large, heavily sclerotized, elongate and pointed to apices, covered with short, pointed setae mainly orientated forwards.

Material examined: holotype and paratype series, as detailed in Inoue (2000) (BMNH).

Eupithecia apparatissima Vojnits, 1988 (Fig. 17)

Eupithecia apparatissima Vojnits, 1988, *Acta zool. Acad. Sci. hung.* **34** (1): 43, figs 14–16. Holotype ♂ (NSMT), Nepal (east): Sagarmatha Solukhumbu, Nangbug, 2,550 m.

This species was described on the base of a single male only. We have found further material, including female specimens, in the collections of M. Fibiger and G. László, and publish here a description and illustration of the female genitalia of *E. apparatissima* Vojnits, 1988 for the first time. On the basis of the structure of the male and female genitalia, *E. apparatissima* Vojnits, 1988 certainly belongs to the *undata* species-group.

Female genitalia (Fig. 44). Bursa copulatrix small, irregular, broadened medially, thick-walled and wrinkled, with rather chaotic bands of spines of various sizes along one side of median area to base. Ductus bursae not expressed. Ductus seminalis narrow, attached to medial part of corpus bursae from right side. Colliculum not expressed. Antrum membranous. Tergite A8 almost quadrate with shallow medial hollow in sclerotized anterior margin. Anterior and posterior apophyses relatively thick, medium length; anterior apophyses slightly expanded and flattened near apices. Papillae anales slightly elongated, tapered to apices, covered with short setae.

Examined type material: ♂, E Nepal, Sagarmatha Solukhumbu, Nangbug, 2,550 m, 5. x. 1979, M.Owada, Vojnits slide no 14690 (holotype of *E. apparatissima* Vojnits, 1988; NSMT).

Other material: 1 ♀, Nepal, Centr., N Ganesh Himal, Gholjong, 2,420 m, 12. x. 1995, leg. M. Fibiger; 2 ♀ ♀, same locality, Godlang, 2560 m, 13. x. 1995, leg. M. Fibiger; 3 ♀ ♀, same locality, Nesim, 2,200 m, 23. x. 1995, leg. M. Fibiger (coll. Fibiger; two specimens in ZISP); 1 ♂, Nepal, Langtang, 2860m, nr Chandrabani, 85°21′E 28°05′N, 25. ix. 1994, leg. Czorba and Ronkay; 1 ♀, Nepal, Ganesh Himal, 2,950 m, 7 km. West of Godlang, 85°14′E 28°10′N, 20. ix. 1995, leg. Herczig and Laszlo (coll. GL).

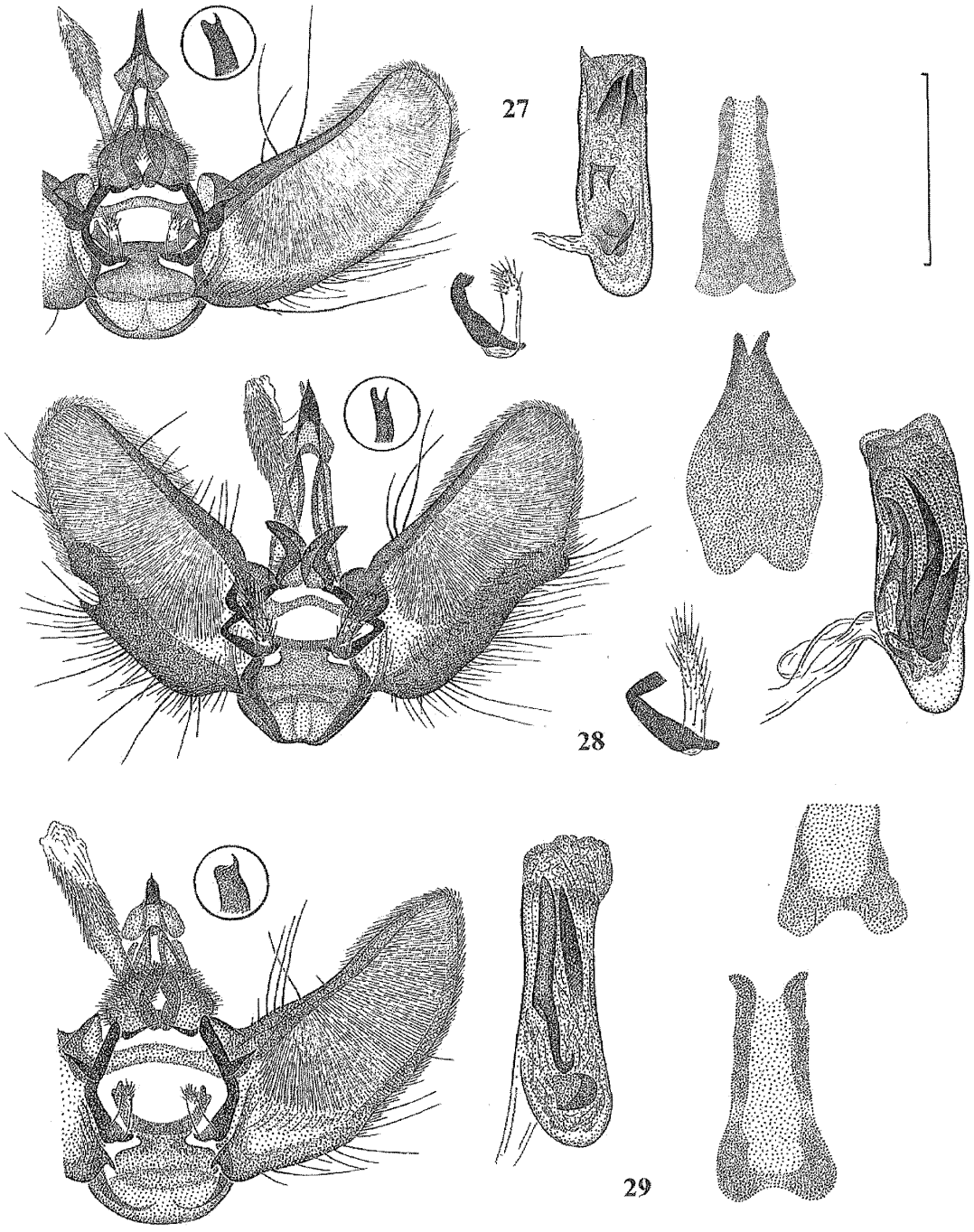
Eupithecia maculosa Vojnits, 1981

Eupithecia maculosa Vojnits, 1981, *Acta zool. Acad. Sci. hung.* **27** (1–2): 230, fig. 14. Holotype ♂ (ZSM), Nepal.
Eupithecia flavitornata Herbulot, 1984, *Miscnea. ent.* **50** (2): 43, figs 7, 11. Holotype ♂ (ZSM), Nepal. (Synonymised in Inoue, 2000).

This species was described on the basis of a single male, as was *flavitornata* Herbulot, and Inoue (2000) subsequently recorded only males. We have discovered a single female specimen in the collection of the Natural History Museum London, and here describe and illustrate the genitalia for the first time.

Female genitalia (Fig. 40). Bursa copulatrix round, densely covered overall with smallish spines. Ductus bursae broadly attached to bursa, tapering evenly towards colliculum, membranous but with an increasing degree of sclerotization towards the posterior end, and with a group of stout spines on ventral side close to bursa. Ductus seminalis broadly attached to ductus close to bursa, its lower part broadened. Colliculum short and narrow. Antrum membranous, wedge-shaped. Tergite A8 broad, its posterior border very poorly defined. Apophyses anteriores, stout and well sclerotized, curled at tips; apophyses posteriores rather long, expanded at apices. Papillae anales short and compact, rather sharp at apices, and covered with dense, extremely short setae.

Examined type material: ♂, Nepal, Helmu-Gebiet, Gusum Banjyang, 2,600 m, 2. ix. 1967, leg. Dierl, Holotypus *Eupithecia maculosa* Vojnits, Vojnits gen. prep. No. 11758, ZSM Genitalprep. No. 10626; ♂, Nepal, 20 km. SSE Katmandu, Route du Phulchoki, 2,400 m, 3. x. 1983, C. Herbulot, *Eupithecia flavitornata* Hrblt. Holotype, Pr. No. 6116, C. Herbulot.

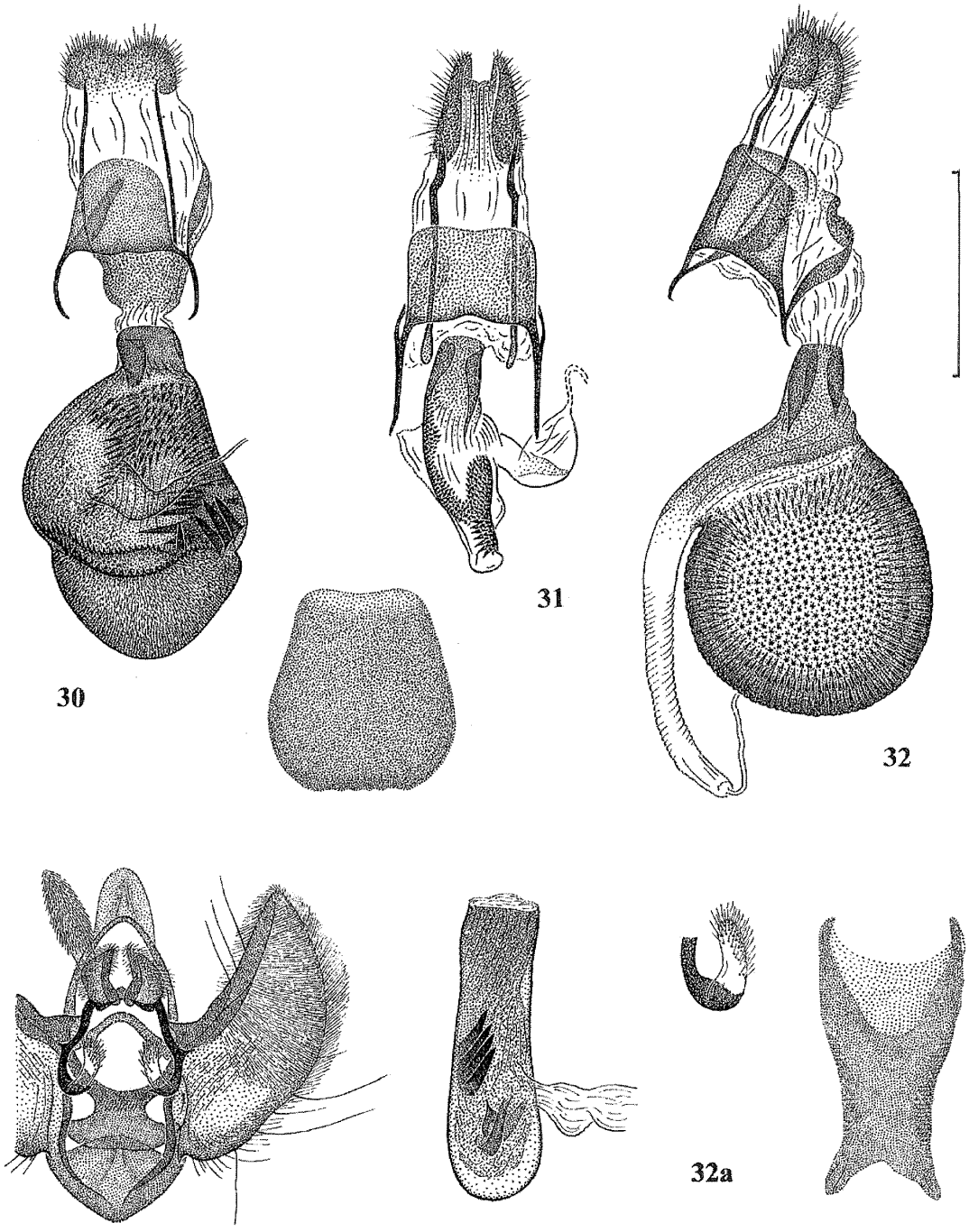


Figs 27–29. Male genitalia of *Eupithecia* species (scale bar = 1 mm; with sternite A8; lateral view of uncus and papillae on the anterior arm of labides enlarged). 27– *E. himalayata* Mironov & Galsworthy, sp. n.; 28– *E. spinibarbata* Mironov & Galsworthy, sp. n. 29– *E. fibigeri* Mironov & Galsworthy sp. n.

Other material: 1♀, Nepal, Godaveri, mixed forest, 1,550–1,700 m, 4. xi. 1983, Lt Col M. G. Allen, BM 1983-254, BMNH Geometrid slide no. 22316.

Eupithecia vojnitsi Inoue, 2000 (Fig. 18)

Eupithecia vojnitsi Inoue, 2000, *Tinea* **16** (Suppl. 1): 43, pl. 168, fig. 17. (Replacement name for *Eupithecia*



Figs 30–32a. Male and female genitalia of *Eupithecia* species (scale bar = 1 mm; male with sternite A8; lateral view of uncus and papillae on the anterior arm of labides enlarged). 30– *E. spinibarbata* Mironov & Galsworthy, sp.n. (with sternite A8); 31– *E. filia* Mironov & Galsworthy, sp. n.; 32– *E. laszloi* Mironov & Galsworthy, sp. n.; 32a– *E. idaeoides*, Mironov & Galsworthy, sp. n.

tenebricosa Vojnits, 1983).

Eupithecia tenebricosa Vojnits, 1983, *Acta zool. Acad. Sci. hung.* **29** (1–3): 274, fig. 15. Holotype ♂ (ZSM), Nepal: Prov. Nr. 3, East Junbesi, 2,750 m. [Junior primary homonym of *Eup (ithecia) ?selinata* f. *tenebricosa* Dietze, 1910, pl. 74, fig. 405.]

This rare Nepalese species was described on the basis of two males. We have found a single

female specimen in the collection of ZSM, and include here a description and illustration of the female genitalia of *E. vojnitsi* Inoue, 2000 for the first time. On the basis of the structure of the male and female genitalia this species is likely to belong to a large group of East Asian species related to *E. rajata* Guénée, 1858, which has not yet been formally described.

Female genitalia (Fig. 43). Bursa copulatrix ovoid, membranous, with a narrow elongate diagonal band of minute short spinules on the ventral side. Ductus bursae elongate, narrow, more strongly sclerotized at its base, with longitudinal striations and with a broad, prominent, sclerotized diverticulum near its base on the left side and also with a folded, V-shaped patch of dense spinules and a narrow longitudinal patch of the same spinules along the right side. Ductus seminalis long, narrow, slightly broadened at base, attached to posterior part of corpus bursae on left side. Colliculum not expressed. Antrum short, broad, covered with numerous pores. Tergite A8 small, quadrate, with a narrowly sclerotized anterior margin and rounded posterior corners. Anterior and posterior apophyses rather elongate, thin. Papillae anales small, short and relatively broad, rounded at apices, covered with short and medium-sized setae.

Examined type material: ♂, Nepal, Prov. Nr. 3, East Junbesi, 2,750 m, 25–31. vii. 1964, leg. W. Dierl, ZSM slide no G10610 (holotype of *E. tenebricosa* Vojnits, 1983; ZSM).

Other material: 1 ♀, Nepal, Helmu-Gebiet, Gusum Banjyang, 2,600 m, 2. ix. 1967, leg. Dierl, Mironov slide no 639 ♀ (ZSM).

Eupithecia costipicta Warren, 1893 (Fig. 19)

Eupithecia costipicta Warren, 1893, *Proc. Zool. Soc. London* **1893** (2): 383, pl. 30, fig. 21. Holotype ♀ (BMNH), India: Sikkim, about 8,000 ft.

Eupithecia gibbosa Mironov & Galsworthy, 2004, *Trans. lepid. Soc. Japan* **55** (4): 285, figs 1, 13. Holotype ♀ (IZCAS), China, Hubei, Shennong, Jiangda, Jiuhu, 1,800 m. **syn.n.**

On further examination of older holotype material, we have concluded that the specimen which we described as *Eupithecia gibbosa* Mironov & Galsworthy, 2004 is in fact a specimen of the little known Asian species *Eupithecia costipicta* Warren, 1893, which was described on the basis of a single female. This represents a very large range extension. The male genitalia of *costipicta* were illustrated in Mironov, Galsworthy & Ratzel, 2008b.

Examined type material: ♀, Sikkim, O. Möller, 8000, 89, *Eupithecia costipicta* Warr. Type ♀, Collection H. J. Elwes, BM Geom. slide no 20130 (holotype of *E. costipicta* Warren, 1893; BMNH); ♀, China, Hubei, Shennong, Jiangda, Jiuhu, 1,800 m, 1. viii. 1981, coll. Han Yinheng, slide no L-2695 (holotype of *E. gibbosa* Mironov & Galsworthy, 2004; IZCAS).

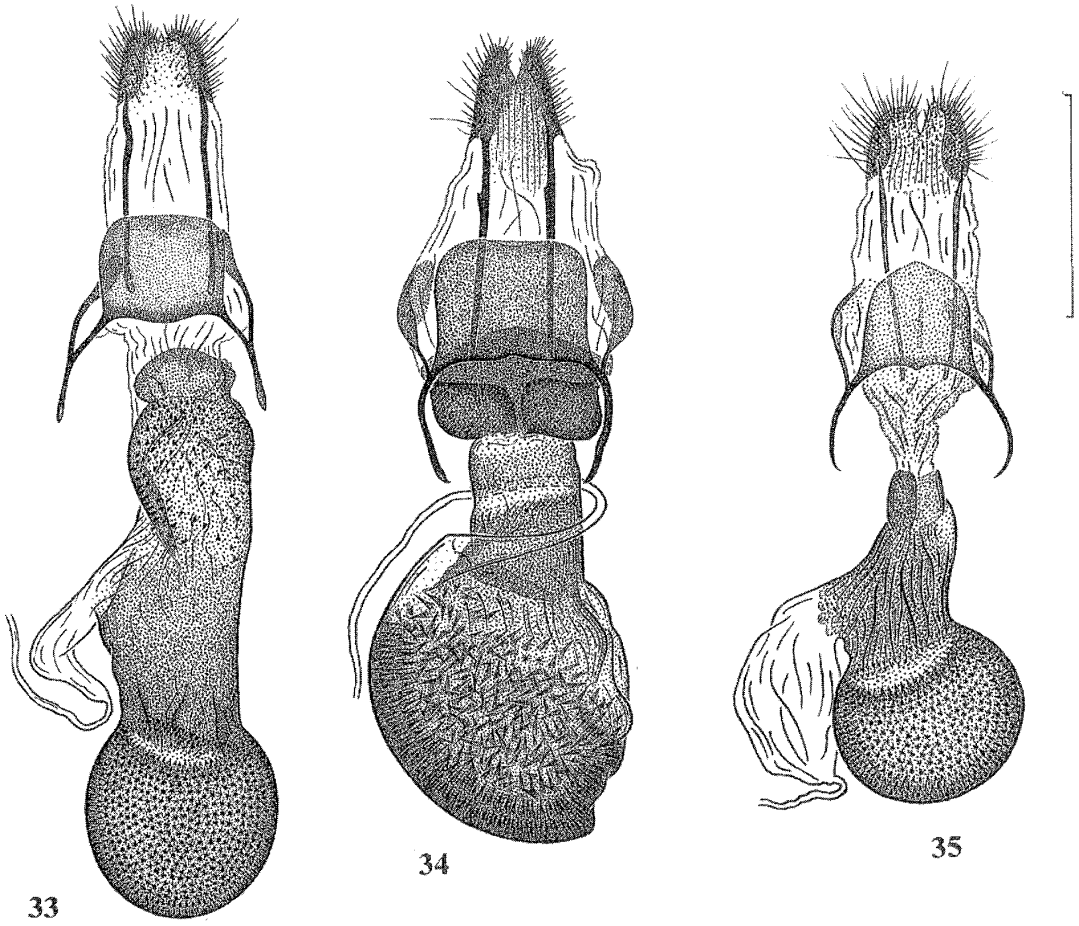
Eupithecia raniata Prout, 1958

Eupithecia raniata Prout, 1958, *Bull. Br. Mus. nat. Hist.* **6** (12): 391. Holotype ♂ (BMNH), India: Darjeeling.

Eupithecia bini Vojnits, 1981, *Acta zool. Acad. Sci. hung.* **27** (1–2): 231, fig. 15. Holotype ♂ (ZSM), Nepal: Prov. Nr. 3, East Junbesi, 2,750 m. **syn.n.**

Eupithecia darjeelica Inoue, 2000, *Tinea* **16** (Suppl. 1): 32, pl. 165, fig. 16; fig. 1293. Holotype ♂ (NSMT), [NE India]: Darjeeling, 2,000 m. (Synonymised in Mironov & Galsworthy, 2009*b*).

This rare mountain species occurs from Nepal to Northern Thailand (Inoue, 2000; Mironov & Galsworthy, 2009*b*). In addition to previous synonymy, we now conclude that *Eupithecia bini*, Vojnits, 1981, is conspecific with *raniata*. As was recorded in Mironov, Galsworthy & Ratzel 2008b, the paratype female of *E. bini* Vojnits, 1981 is not conspecific with the holotype male, but is an example of *E. rajata* Guénée, 1858. We record below further records of this species from Nepal.



Figs 33–35. Female genitalia of *Eupithecia* species (scale bar = 1 mm). 33– *E. singhalensis*, Mironov & Galsworthy, sp. n.; 34– *E. kama* Mironov & Galsworthy, sp. n.; 35– *E. himalayata* Mironov & Galsworthy, sp. n.

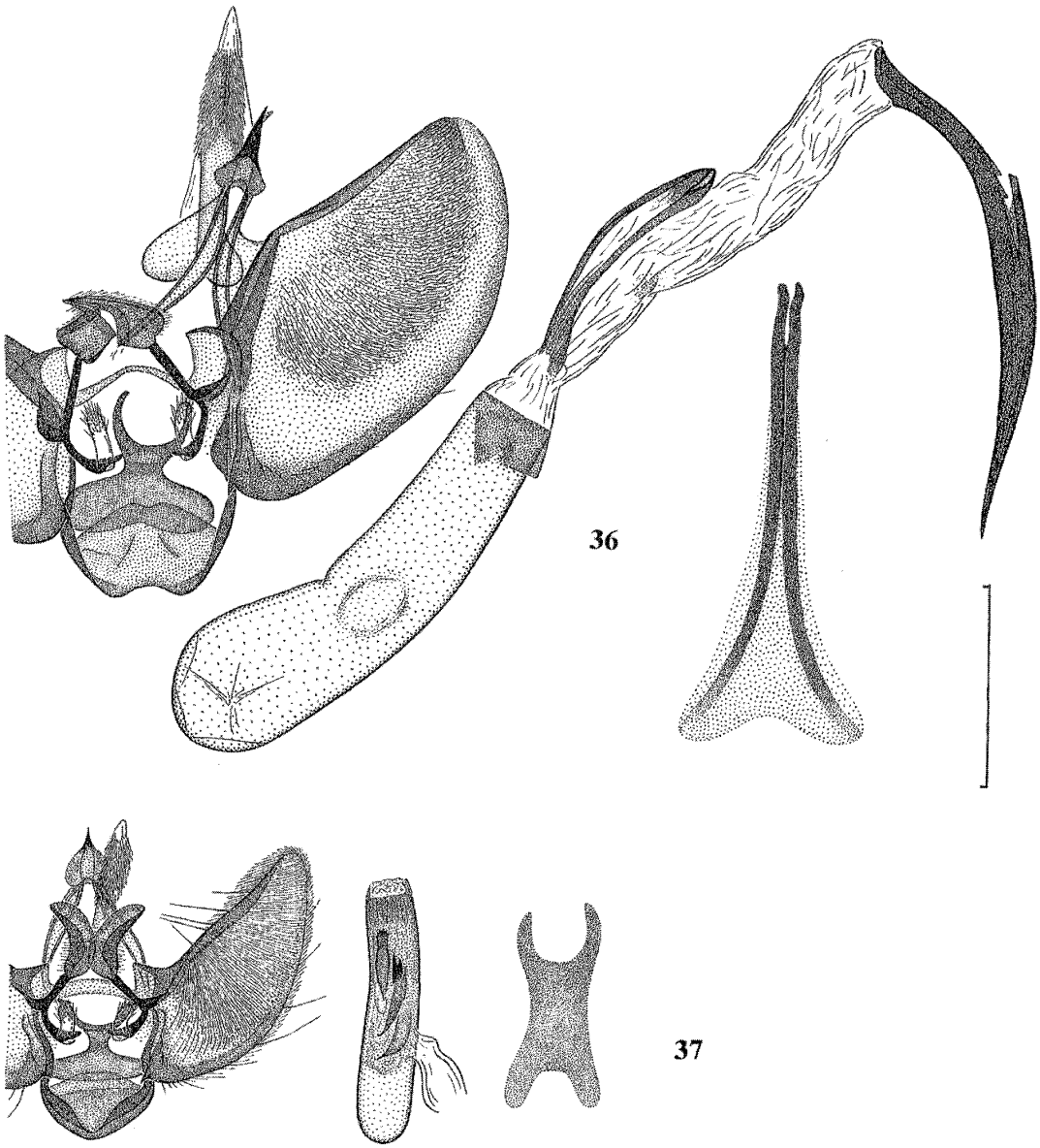
Examined type material: ♂, Darjeeling, Aug. 1904, *Eupithecia raniata* Prout type ♂, BM Geom. slide no 16421 (holotype of *E. raniata* Prout, 1958; BMNH); ♂, Nepal, Prov. Nr. 3, East Junbesi, 2,750 m, 25–31. vii. 1964, leg. W. Dierl, ZSM slide no G10615 (holotype of *E. bini* Vojnits, 1981; ZSM); ♂, India, Darjeeling (Town), 2,000 m, 11–20. viii. 1985, *ex* J. H. Cadiou, Inoue slide no 16956♂ (holotype of *E. darjeelica* Inoue, 2000; NSMT).

Other material: 1♂, Nepal, Prov. Nr. 3, East Junbesi, 2,750 m, 25–31. vii. 1964, leg. W. Dierl (ZSM); 1♀, Nepal, 17 km SSE Katmandu, Route du Phulchoki, 1,750 m, 29. ix. 1983, C. Herbulot; 1♀, same locality, 18 km SSE Katmandu, Route du Phulchoki, 2,100 m, 1. x. 1983, C. Herbulot; 1♀, same locality, 20 km SSE Katmandu, Route du Phulchoki, 2,400 m, 3. x. 1983, C. Herbulot (all in coll. Herbulot in ZSM); 2♂♂, Indien, WB Darjeeling, Tigerhill, 2,400 m, 29–31. viii. 1988, leg., W. Thomas (ZFMK).

Eupithecia discolor Vojnits, 1983 (Fig. 20)

Eupithecia discolor Vojnits, 1983, *Acta zool. Acad. Sci. hung.* **29** (1–3): 277, figs 21, 24. Holotype ♂ (ZSM), Nepal: Gosainkund Lekh, Tarke Banjyang, 3600 m.

Inoue (2000) synonymised *E. discolor* Vojnits, 1983 with *E. rubridorsata* Hampson, 1895. We have studied the holotypes of both these species and other additional material. In our



Figs 36–37. Male genitalia of *Eupithecia* species (scale bar = 1 mm; with sternite A8). 36– *E. infestata* Swinhoe; 37– *E. asema* Hampson.

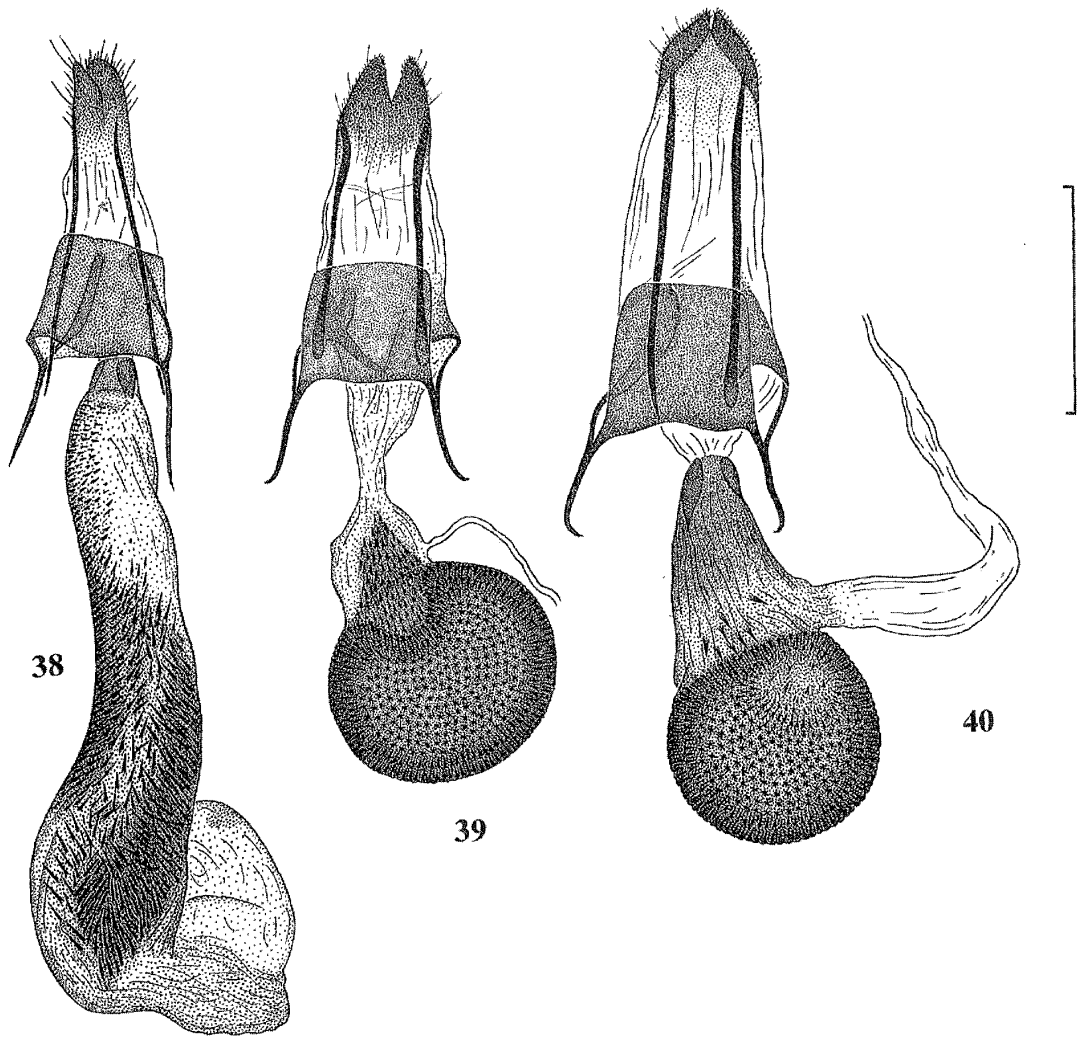
opinion, *E. discolor* Vojnits, 1983 is a bona species. Here, we return this latter name to full specific status **stat. rev.**

Examined type material: ♂, Nepal, Gosainkund Lekh, Tarke Banjyang, 3,600 m, 27. viii. 1967, leg. Dierl-Schacht, ZSM slide no G10624 (holotype of *E. discolor* Vojnits, 1983; ZSM).

Other material: 1♂, 1♀, Nepal, Gosainkund Lekh, Tarke Banjyang, 3,600 m, 30. viii. 1967, leg. Dierl-Schacht (ZSM); 1♂, Nepal, Helmu-Gebiet, Gusum Banjyang, 2,600 m, 5. ix. 1967, leg. Dierl (ZSM).

Syncosmia trichophora Hampson, 1895

Chloroclystis trichophora Hampson, 1895, *Fauna Br. India (Moths)*, **3**: 393: Syntype(s), ♂, (BMNH), [India, Nilgiri Plateau].

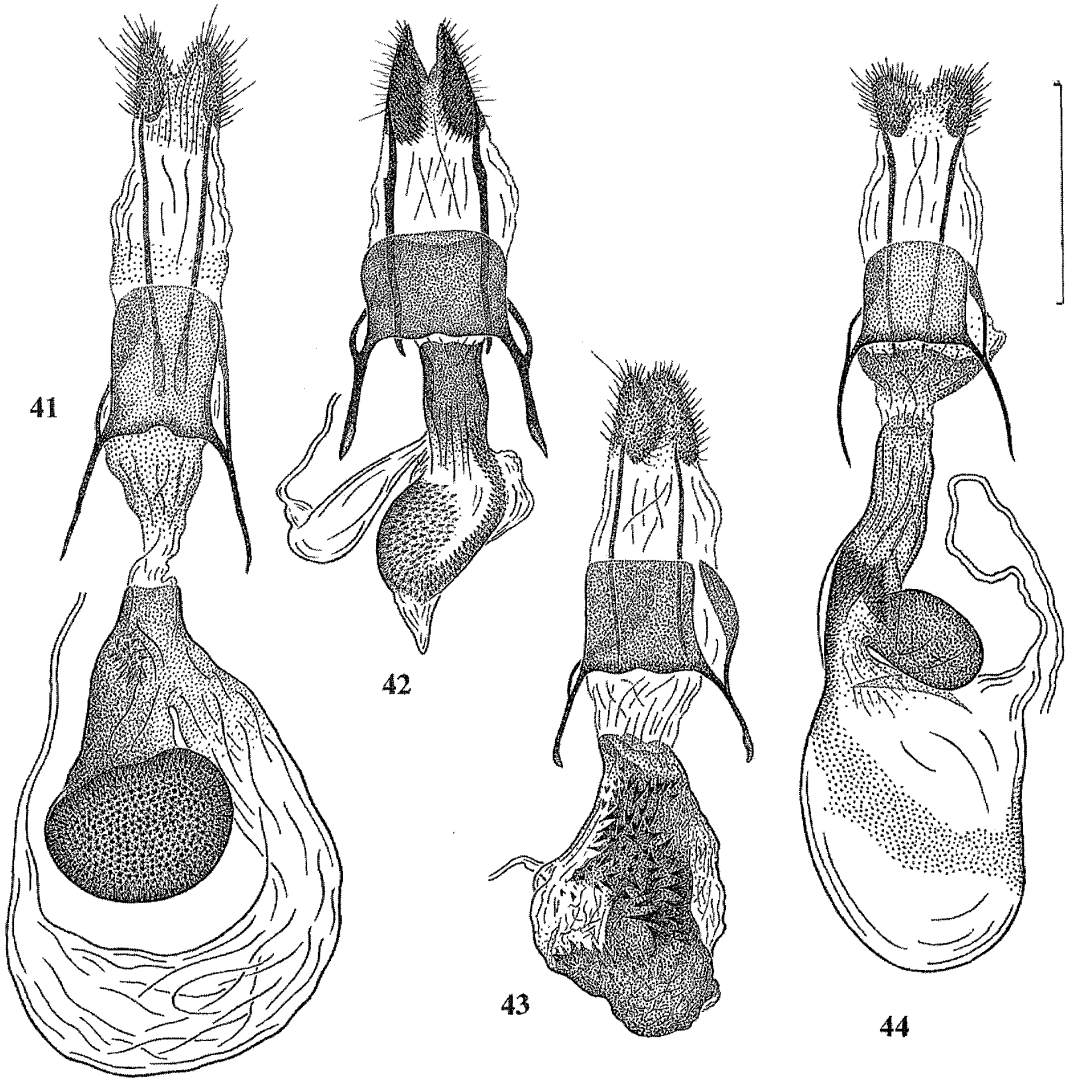


Figs 38–40. Female genitalia of *Eupithecia* species (scale bar = 1 mm). 38– *E. infestata* Swinhoe; 39– *E. albifurva* Hampson; 40– *E. maculosa*, Vojnits.

Eupithecia subviridis Vojnits, 1983, *Acta zool. Acad. Sci. hung.* **29** (1–3): 279, fig. 25. Holotype ♀ (ZSM), Nepal: Prov. Nr. 2, East Bhandar unter Thodung, 2,200 m **syn. n.**

The taxon *subviridis* was described by Vojnits on the basis of two females, and placed by him provisionally in *Eupithecia*, hence its inclusion in this paper. We have studied the holotype of this taxon and additional specimens, including associated males, in the collection of ZFMK (Bonn) and the private collection of Mr M. Fibiger (Sorø, Denmark). Vojnits' types appear to be identical both in facies and genitalia to females of *Syncosmia trichophora* Hampson, 1895, in the BMNH series and the associated males are identical to the type material of the latter. We therefore have no hesitation in synonymising the names. Vojnits' drawing of the female genitalia is wildly inaccurate, and we therefore include drawings here of both male and female genitalia (Figs 46 and 47)

Examined type material: ♂, Collection H. J. Elwes, *Chloroclystis trichophora* Hampson type ♂, Nilgiri Plateau, Rothschild bequest BM 1939-1 (holotype of *Syncosmia trichophora*); ♀, Nepal, Prov. Nr. 2, East Bhandar unter Thodung, 2,200 m, 4. viii. 1964, leg. W. Dierl, ZSM slide no G10606 (holotype of *Eupithecia subviridis* Vojnits, 1983; ZSM).



Figs 41–44. Female genitalia of *Eupithecia* species (scale bar = 1 mm). 41– *E. fessa* Mironov & Galsworthy, nom. n.; 42– *E. liberata* Inoue; 43– *E. apparatissima* Vojnits; 44– *E. vojnitsi* Inoue.

Other material: 2♂, 3♀, Indien WB, Darjeeling, Tiger Hill, 2,400 m, 19–28. vi. 1987, leg. W. Thomas, Mironov slides nos 629♂, 628♀ (ZISP); 1♀, Nepal, NW Pokhara, Banthati, 2350 m, 30. vii. 1996, leg. M. Fibiger; 1♀, Nepal, Gandaki, Koketani, 2,600 m, 3–4. viii. 1996, leg. M. Fibiger, Mironov slide no 623♀ (both in coll. Fibiger).

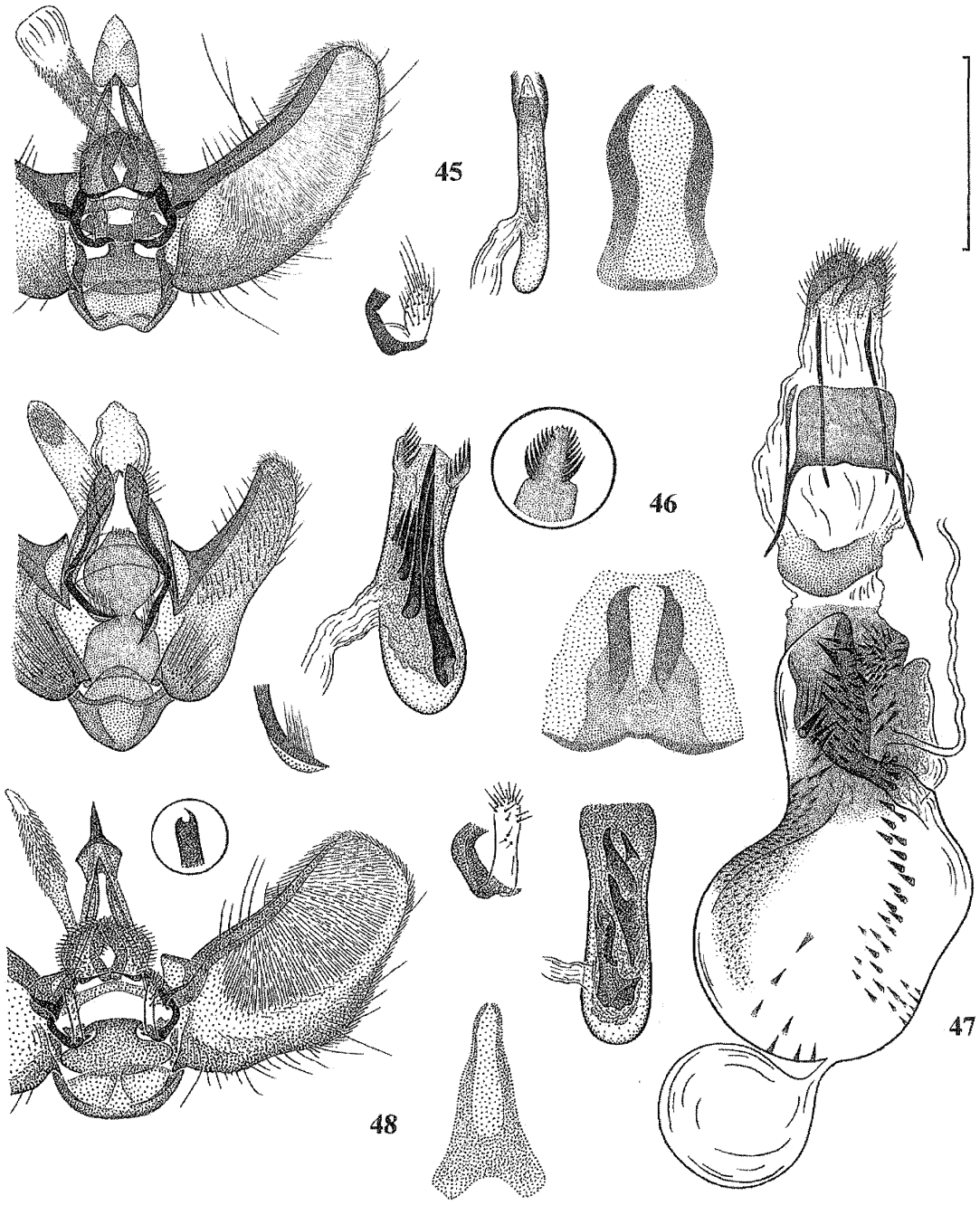
New distribution records for *Eupithecia* in the Indian subcontinent

Eupithecia anasticta Prout, 1926

Eupithecia anasticta Prout, 1926, *J. Bombay nat. Hist. Soc.* **31** (2): 317.

New to the fauna of India.

Examined type material: ♀, Upper Burma: Hpimaw Fort, Nr. Myitkyina, 8,000 ft., 9–13. viii. 1923, Capt. A. E. Swann, *Eupithecia anasticta* Prout ♀ type, Brit. Mus. 1923–488, BM Geom. slide no 20305♀ (holotype of *E. anasticta* Prout, 1926, BMNH).



Figs 45–48. Male and female genitalia of *Eupithecia* and *Syncosmia* species (scale bar = 1 mm; males with sternite A8; lateral view of uncus and papillae on the anterior arm of labides enlarged). 45– *E. lactibasis* Inoue; 46, 47– *Syncosmia trichophora* Hampson (male with structure at tip of aedeagus enlarged); 48– *E. coccinea* Vojnits.

Other material: 4♂♂, [India], Sikkim, Mt. Kanchanjunga SE, 27°30′N, 88°20′E, 2,650 m, 4. viii. 1995, leg. E. Afonin & V. Sinjaev, *ex* coll. A. Schintlmeister (ZFMK); 4♂♂, 4♀♀, same locality, 2,600 m, 9–10. viii. 1995, leg. E. Afonin & V. Sinjaev, *ex* coll. A. Schintlmeister (ZFMK).

Eupithecia barteli Dietze, 1908

Eup (ithecia) barteli Dietze, 1908, *Dt. ent. Z. Iris* **21** (2): 162, pl. 2, figs 13, 14.
Eupithecia artshae Viidalepp, 1988, *Fauna pyadenits gor Srednej Azii [Geometridae fauna of the Central Asian mountains]*: 124, pl. 2, fig. 21; text-pl. 28, figs 2, 3, 6–8.

New to the fauna of Nepal.

Examined type material: ♀, Uralsk, Original ♀ (K. Dietze) (lectotype of *E. barteli* Dietze, 1908, [MNHU]).

Other material: 3♀♀, Nepal, 17 km SSE Katmandu, Route du Phulchoki, 1750 m, 28, 29 and 30. ix. 1983, C. Herbulot, Mironov slide no 638♀ (all in coll. Herbulot in ZSM).

Eupithecia interrubrescens (Hampson, 1902)

Phibalapteryx interrubrescens Hampson, 1902, *J. Bombay nat. Hist. Soc.* **14** (3): 513.

New to the fauna of Nepal.

Examined type material: ♀, [China], Yatung, Tibet, A. E. Hobson, 98–201, *Phibalapteryx interubrescens* Hmpsn., Type ♀, BM Geom. slide no 2941 (holotype of *Ph. interrubrescens* Hampson, 1902, BMNH).

Other material: 1♂, Nepal, Dudh Kosi Tal, 3,500 m, 22–23. vii. 1962, leg. G. Ebert u. H. Falkner (ZSM).

Eupithecia jezonica Matsumura, 1927

Eupithecia jezonica Matsumura, 1927, *Insecta matsumur.* **1** (4): 184.
Eupithecia viidaleppi Vojnits, 1981, *Annls hist.-nat. Mus. natn. hung.* **73**: 232, figs 16, 18.
Eupithecia catosophia Inoue, 1988, *Bull. Fac. domest. Sci. Otsuma Wom. Univ.* **24**: 336, figs 9a-f .

New to the fauna of Nepal.

Material: 1♂, Nepal, 17 km SSE Katmandu, Route du Phulchoki, 1,750 m, 28. ix. 1983, C. Herbulot; 1♀, same locality, 20 km SSE Katmandu, Route du Phulchoki, 2,400 m, 4. x. 1983, C. Herbulot (all in coll. Herbulot in ZSM).

Eupithecia latimedia Hampson, 1895

Eupithecia latimedia Hampson, 1895, *Fauna Br. India (Moths)* **3**: 400.

New to the fauna of Nepal.

Examined type material: ♀, [India], Dalhousie, 92-98, Harford Coll. 23/6/91, *Eupithecia latimedia* Hmpsn. type ♂ (lectotype of *E. latimedia* Hampson, 1895, BMNH).

Other material: 1♀, C-Nepal, Kali-Gandaki Tal, Kalopani-Dhumpu, 2,500 m, 3. vi. 1973, leg. Dierl-Lehmann (ZSM); 1♂, Nepal, Kathmandu Valley, Godavari, 1,539 m, 9–24. v. 1989, leg. Schnitzler (ZFMK).

Eupithecia lineosa Moore, 1888

Eupithecia lineosa Moore, 1888, *Descr. new Indian lepid. Insects Colln late Mr W.S. Atkinson* (3): 268.

New to the fauna of Nepal.

Examined type material: ♂, Kashmir, Gulmarg, 19. vii. 31, Fletcher coll., Brit. Mus. 1932–13,

Eupithecia lineosa gulmargensis Prout ♂ type (holotype of *E. lineosa* gulmargensis, BMNH).

Other material: 1♂, 1♀, Nepal, 17 km SSE Katmandu, Route du Phulchoki, 1,750 m, 28 and 29. ix. 1983, C. Herbulot (coll. Herbulot in ZSM).

Eupithecia ruficorpus Warren, 1897

Eupithecia ruficorpus Warren, 1897, *Novit. zool.* **4**: 230.

Inoue (2000) included *E. ruficorpus* in his *Eupithecia fauna* of Nepal, but this was on the basis of his belief that *E. albicans* Vojnits, 1981 was a synonym of *ruficorpus*. The specimens cited were all examples of *E. albicans*. We resurrected *E. albicans* as a good species (Mironov, Galsworthy & Ratzel 2008*a*) and subsequently synonymised it with *E. leucenthesis* Prout, 1926 (Mironov & Galsworthy 2009*b*). *E. ruficorpus* can however now be added to the fauna of Nepal, based on 3 specimens, which we have examined.

Examined type material: ♀, Khasis, Oct. 1896, Nat. Coll., *Tephroclystia ruficorpus* Warr. Type ♀ (holotype of *E. ruficorpus* Warren, 1897, BMNH); ♂, Nepal, Dudh Kosi Tal, 3,500 m, 22–23. vii. 1962, leg. G. Ebert u. H. Falkner, ZSM slide no G10628♂ (holotype of *E. albicans* Vojnits, 1981, ZSM).

Other material: 1♂, Nepal, 18 km SSE Katmandu, Route du Phulchoki, 2,100 m, 1. x. 1983, C. Herbulot (coll. Herbulot in ZSM); 2♂♂, Nepal, Gandaki, Koketani, 2,600 m, 3–4. viii. 1996, leg. M. Fibiger (coll. Fibiger); 1♀, Indien, Sikkim, Pemayangtse, 2,000 m, 20–27. viii. 1988, leg. W. Thomas (ZFMK); 1♂, [India], Sikkim, Mt. Kanchenjunga SE, 27°30′N, 88°20′E, 2,600 m, 9–10. viii. 1995, leg. E. Afonin & V. Sinjaev, *ex* coll. A. Schintlmeister (ZFMK).

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We are grateful to Dr A. Hausmann (ZSM, Munich, Germany), Mr M. Fibiger (Sorø, Denmark), Dr D. Stüning (ZFMK, Bonn, Germany) and Dr M. Owada (NSMT, Tokyo, Japan) for kind support of the authors when visiting respectively the Zoologische Staatssammlungen, Munich, the private collection of Mr M. Fibiger, the Zoologisches Forschungsinstitut und Museum Alexander Koenig, and the National Science Museum of Tokyo. We also thank Mr Gyula M. László (Budapest) for loan of material from his private collection. Thanks are also due to Mr P. Skou for important help provided to Dr Mironov during his visit to Denmark, to Deutsche Forschung Gemeinschaft (DFG; grant no 436 RUS 17/99/02) and to The Royal Society of the UK for grants which enabled Dr Mironov to do extensive studies on Asian Eupitheciini in ZFMK (Bonn) and BMNH (London) respectively. Finally we are grateful to Dr Malcolm Scoble and Dr Jeremy Holloway at BMNH for reading the manuscript and commenting helpfully.

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摘　　要

ネパールおよびインド亜大陸からのカバナミシャク属 (鱗翅目, シャクガ科) の追加記録
(Mironov V. G・Galsworthy A. C.)

これまで著者らは東アジアから南アジアのカバナミシャク属について一連の調査をし, 台湾 (Mironov and Galsworthy, 2007), ヒマラヤ西部 (Mironov, Galsworthy and Ratzel, 2008*a*, *b*, *c*), および東南アジア (Mironov & Galsworthy, 2009*a*, *b*) の記録を再検討してきた. 本論文では, これらで取り扱わなかったインド亜大陸部の同属標本を再検討し, 13 新種を含む 34 種を見出した. 13 新種は *Eupithecia lusoria* sp. n., *E. rulena* sp.n., *E. superata* sp. n., *E. himalayata* sp. n., *E. claudei* sp.n., *E. nervosa* sp. n., *E. spinibarbata* sp. n., *E. fibigeri* sp. n., *E. filia* sp. n., *E. laszloi* sp. n., *E. singhalensis* sp. n., *E. kama* sp. n., *E. idaeoides* sp. n.であり, 成虫標本と交尾器形態の図示を添えて詳細に記載した.

本研究で取り扱った種のうち, 知見の少ない 10 種については追加の標本が得られたため, *E. asema* Hampson, 1891, *E. lactibasis* Inoue, 2000, *E. coccinea* Vojnits, 1981, についてはオス交尾器を, *E. albifurva* Hampson, 1907, *E. liberata* Inoue, 2000, *E. apparatissima* Vojnits, 1988, *E. maculosa* Vojnits, 1981, *E. vojnitsi*

Inoue, 2000, *E. fessa* Mironov & Galsworthy nom. n. はメス交尾器を, *E. infestata* Swinhoe, 1890 は雌雄交尾器を図示し, 再記載した. これらのうち *E. fessa* Mironov & Galsworthy nom. n. は, インドの標本から記載された *E. pallescens* Inoue, 2000 が, Dietze (1910) によって中央アジアから記載された *E. sinuosaria* f. *pallescens* のホモニムとなるため置換名として提唱した.

また, 以下の3種については新たにシノニムであることを認めた. 中国から記載された *E. gibbosa* Mironov & Galsworthy, 2004 (模式産地: 中国湖北省) を *E. costipicta* Warren, 1893 (模式産地: シッキム) のシノニム, *E. bini* Vojnits, 1981 (模式産地: ネパール)を *E. raniata* Prout, 1958 (模式産地: ダージリン) のシノニム, *Eupithecia subviridis* Vojnits, 1983 (模式産地：ネパール) を *Syncosmia trichophora* (Hampson, 1895) (模式産地：インド・ニルギリ) のシノニムとして整理した. つづいて Inoue (2000) によって *E. rubridorsata* Hampson, 1895 のシノニムとされた *E. discolor* Vojnits, 1983 は追加標本による再検討の結果, 別種と判断されたため有効名とした.

さらに, 本調査域で新たに以下の7種の分布を確認した. 国別に挙げるとインドから *E. anasticta* Prout, 1926, ネパールから *E. barteli* Dietze, 1908, *E. interrubrescens* (Hampson, 1902), *E. jezonica* Matsumura, 1927, *E. latimedia* Hampson, 1895, *E. lineosa* Moore, 1888 を初記録した. 加えて, *E. ruficorpus* Warren, 1897 がインドとネパールの両方に確実に分布することが分かった. Inoue (2000) は *E. ruficorpus* をネパールから記録したが, *E. albicans* Vojnits, 1981 を本種のシノニムと考えていたため, 実際に調べた標本はすべて *E. albicans* であった. 著者ら (Mironov, Galsworthy and Ratzel 2008*a*) は *E. albicans* を有効名として復活させたが, 今回 *E. ruficorpus* と同定できるネパール産3個体を確認した.

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